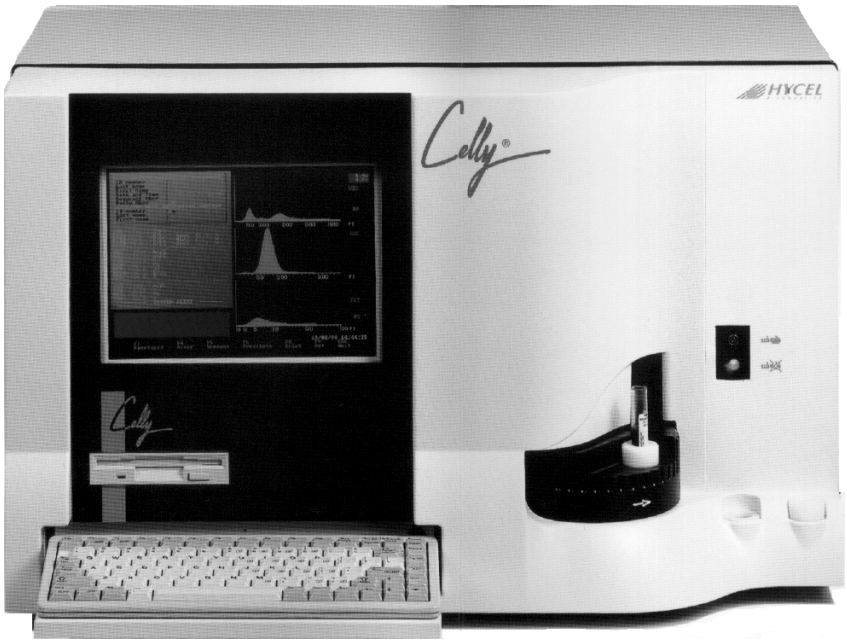
Field Service Manual

(V 2.40)



HYCEL DIAGNOSTICS
4, rue Galvani
91745 Massy cedex
FRANCE
tél. : (33) 1 64 53 15 15
Fax : (33) 1 64 53 15 20
E-Mail : hycel.com@wanadoo.fr

Factory :
Parc d'activités, Rue de Gerhoui
BP 6
35651 Le Rheu Cedex
FRANCE
Tél. : (33) 2 99 14 54 14
Fax : (33) 2 99 14 54 25
E-Mail : hycel.diagnostics@wanadoo.fr

I Introduction

This service manual is intended to provide information on how to adjust, calibrate and repair this analyzer.

I.1.General specifications

CELLY is an 18 parameters hematology cell counter, safe, simple and reliable.

I.1.1. Numeration parameters

- WBC White blood cells numeration (M/µL)
  Lymphocytes or Lym (K/L and %)
  Middle Cells or Mid (en K/L et en %)
  Granulocytes ou Grn (en K/L et en %)
- HGB Hemoglobin (en g/dL)
- RBC Red blood cell numeration (M/L)
  MCV Middle cell volume (fl)
  HCT (%)
  MCH (pg)

  $$MCH(pg)=\frac{HGB(g/dL)x10}{RBC(M/\mu L)}$$

  MCHC (g/dL)

  $$MCHC(g/dL)=\frac{HGB(g/dL)x100}{HCT(\%)}$$

  RDW
- PLT Platelets numeration
  MPV middle platelet volume
  PCT Plateletocrite
  PDW

I.1.2. WBC differential

WBC differentiation is made in two forms, one measured and one calculates. Percentages are measured and absolute values are calculated with percentages and WBC total.
There are 3 WBC populations in two forms:

- Lymphocytes % et # (percentage et absolute value)
- Middle cells % et # (percentage et absolute value)
- Granulocytes % et # (percentage et absolute value)

I.1.3. Graphiques

- WBC histogram
- RBC histogram
- PLT histogramme

I.1.4. Throughput

40 to 45 tests/hour (depending on configuration)

I.1.5. Sample mode

Whole blood (32 µL) or prediluted (25 µL).

I.1.6. Storage capacity

CELLY can keep in memory more than 100000 results with histograms.

I.1.7. Precision

GR<3%(5M)
GB<3%(10000)
HGB<3%(14g/dL)
HTC<3%(45%)
PLT<6%(250000)

I.1.8. Computer

Pentium mother board
QWERTY 84 keystrokes keyboard
9"1/4 LCD color screen
Hard disk
2"1/2 floppy disk
RS232 output (host computer)
Parallel output (optional printer)

I.1.9. Sizes and weight

Height = 42 cm
Width = 62,5 cm
Depth = 42 cm
Weight = 25 kg

I.1.10. Power supply

230 V ±10% 50Hz
115 V±10% 60Hz
Power: 300 VA

I.2.General description

I.2.1. Reagent system

Celly uses only 4 different reagents:

- Hematon plus (diluent)
- Hemaref II (detergent)
- Cellyse (lysing agent)
- Dataclean (end of day cleaner)

I.2.2. Electronic system

There are 9 electronic boards in the CELLY and 3 electronic circuits.

I.2.3. Fluidic system

CELLY uses 4 syringes controlled by 2 24VDC motors step-by-step motors and also twelve pinch electrovalves.

I.2.4. Mechanical system

Le CELLY mechanical system is composed of two mechanical assemblies controlled by two 24 VDC step-by-step motors:

- Sampling needle assay
- Turret assay.

II Theory of operation

II.1.Particle detection method

CELLY uses two apertures of defined diameter and length for cell detection and employs the resistance variation principle.
An internal and an external electrode each at one side of the aperture are connected to a constant current source.
The cells are suspended in an electrolyte solution of buffered isotonic diluent.
A vacuum is applied to the back of the aperture in order to pull the cells through the orifice.
Cells are present a short time in the sensing zone of the orifice and increase the resistance of the aperture displacing an equivalent volume of diluent.
The constant current source tries to maintain that current with a proportional increase in voltage. An amplifier produces a signal, which represents the volumetric size of the cell within the sensing zone.
WBC, RBC and PLT have a separate amplification line even if RBC and PLT have a common pre-amplification line.
Each parameter is converted separately.

II.2.WBC and RBC/PLT theory

II.2.1. WBC

The WBC dilution is drawn through a ruby aperture 80 µm in diameter and 80 µm in length.
CELLY WBC counting time is determined through a 176 µL glass metering tube (between two optical detectors).
CELLY performs 2 counting sequences of about 8 seconds each.
Each sequence is divided in 4 partitions of 2 seconds, which are compared one with another to check if there has not been any trouble during the count (clog, air bubble…).
The program calculates the mean value of the 4 partitions, the Standard Deviation and the Coefficient of Variation. The CV tolerated for each sequence according to the number of particles counted is set in a hidden menu.
In case the CV calculated is higher than the CV tolerated, the program rejects the partition, which is the furthest from the mean value. A new CV is then calculated with the 3 remaining partitions. If this CV is, again, too high, the whole sequence is rejected and it is not taken into account for the final result displayed. If the CV is acceptable, the sequence composed of only 3 partitions will be used in the final result calculation.
It may happen that both sequences are rejected. In such a case, a result is calculated but an alert S3 is displayed meaning that the result is not valid. The sample should, thus be re-run.
The count starts when the rear of a calibrated bubble (generated a few seconds before the count starts) passes in front of an optical detector. And the count stops when the rear of the same bubble passes in front of a second detector.
The usual TOF (Time Of Flight = counting time) is about 8 seconds depending on the WBC orifice and glass metering tube tolerances.
When this TOF is 1 second above the reference time, an alert S6 is displayed.
When WBC TOF is more than 12 seconds an alert S7 is displayed.
If WBC TOF is too short (0.5 s under the reference time), an alert S5 is displayed.

II.2.2. RBC and platelet theory

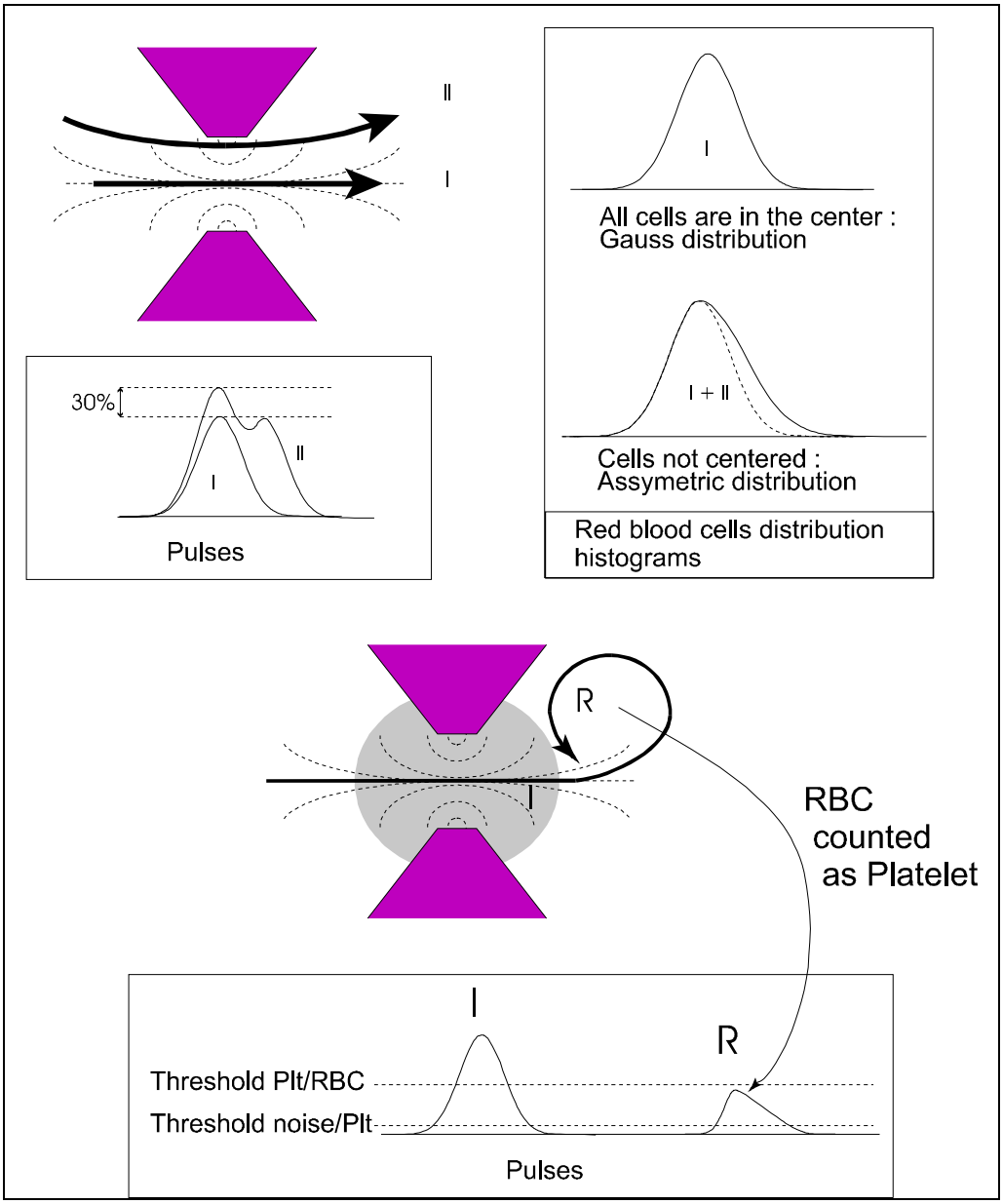
RBC and PLT determination is done on a fixed time through a ruby aperture 60 µm in diameter and 80 µm in length.
CELLY performs 2 sequences of 8 seconds each. Each sequence is divided in 4 partitions of 2 seconds, which are compared one with another to check if there has not been any trouble (clog, air bubble) during the count.
The program calculates the mean value of the 4 partitions, the Standard Deviation and the Coefficient of Variation. The CV tolerated for each sequence according to the number of particles counted is set in a hidden menu.
In case the CV calculated is higher than the CV tolerated, the program rejects the partition, which is the furthest from the mean value. A new CV is then calculated with the 3 remaining partitions. If this CV is, again, too high, the whole sequence is rejected and it is not taken into account for the final result displayed. If the CV is acceptable, the sequence composed of only 3 partitions will be used in the final result calculation
It may happen that both sequences are rejected. In such a case, a result is calculated but an alert S3 is displayed meaning that the result is not valid. The sample should, thus be re-run.

II.3.Hemoglobin measurement

The hemoglobin sample is measured in the WBC/HGB cuvette where lysing agent is added to the primary dilution.
A voltage ratio is derived from measuring the voltage with clear reference in the WBC cuvette and measuring the voltage with sample in that same cuvette.
A function of the ratio of the two measurements determines the HGB concentration.
Light is concentrated through the sample by use of two glass pipes (HGB optical conductors) contained within the WBC/HGB cuvette.
The light from a 555 nm led passes through these light pipes and the sample to a photodetector.
The current generated at the output of the photodetector is proportional to the amount of light received by the detector.
This current is then routed to an amplifier.

II.4.Corrections

II.4.1. Swirling back

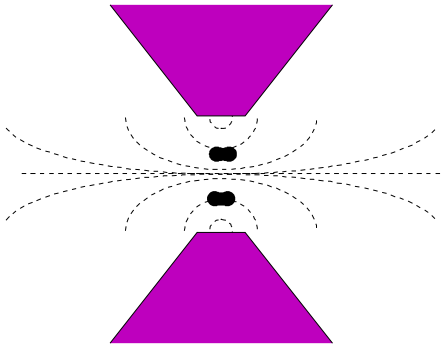


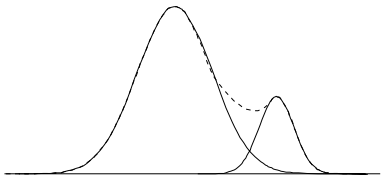
There are two ways to avoid the swirling back of the cells:

- Aspiration point just behind the aperture to avoid that the cells cut again the electric field of the aperture. This aspiration is done by the electrode, which is hollow and long, so it can arrive just behind the orifice. The swirling back of the RBC is the most important because it creates a wrong impulsion like a platelet. For the WBC the electrode is not long because there is practically no swirling back.
- The electronic time of passage: if a cell re-cuts the electric field, it creates a new impulsion, which has a electronic time of passage more long than normal times.

This function eliminates the pulses too much distorted, due to a new passage of the cell in the orifice electric field. For that the time of the pulse is compared to the period of an electric component (monostable), which can be modified.

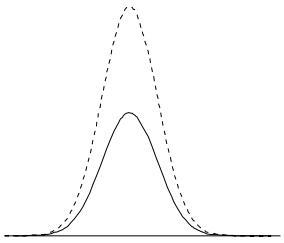
II.4.2. Coincidence



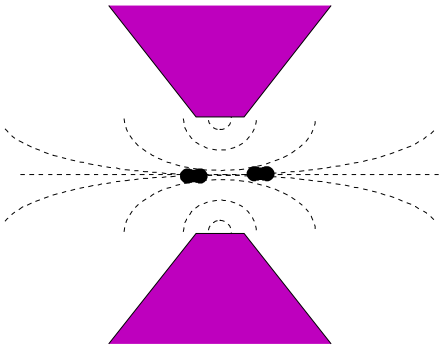


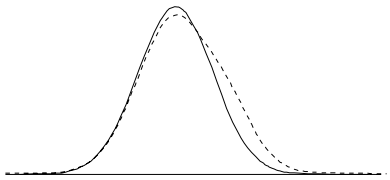
Cells with vertical coincidence generatea second population (artefact) with doubled volume.

Red blood cells distribution histograms.



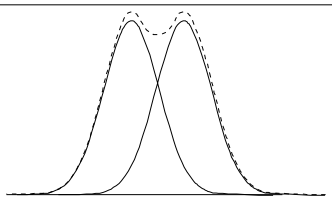
Pulses : doubled surface





Cells with horizontal coincidence generate an assymetry of the distribution and a loss of cells.

Red blood cells distribution histograms.



Pulses : amplitude increased of about 5% and the two peaks are linked in only one.

Coincidence is when two cells are in the same time in the orifice. To avoid this, the CELLY use a statistic treatment of the results.

II.4.3. Pulse edit

This program is done to process impulsions even if the cells were not go in the middle of the orifice.

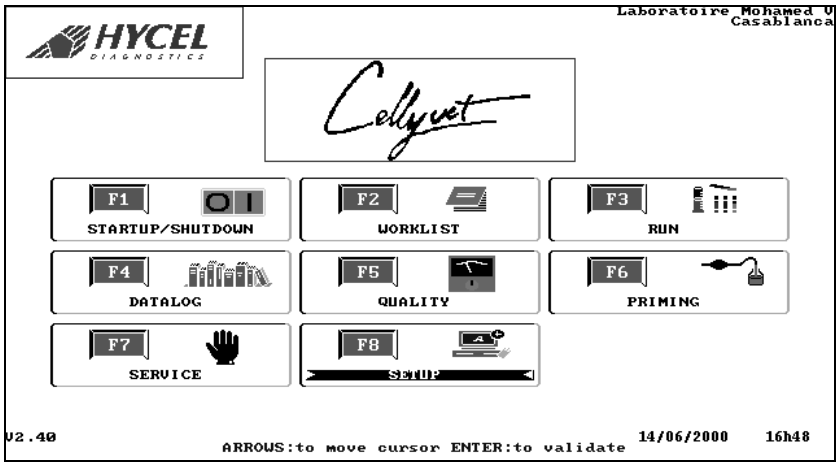
III Software description

III.1. Introduction

The software application has been developed for Microsoft DOS and IBM compatible computers. Menu items are selected with the arrow key and activated by pressing the "enter" keystroke. Menu items are also selected and activated by pressing the given keystroke.

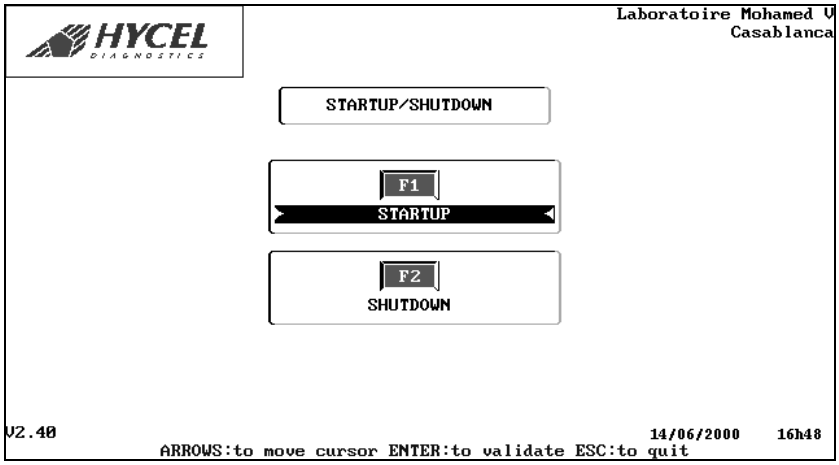
III.2. Main menu

- Startup/Shutdown F1
- Worklist F2
- Run F3
- Datalog F4
- Quality F5
- Priming F6
- Service F7
- Setup F8



III.3. Startup/Shutdown F1

- Startup F1
- Shutdown F2



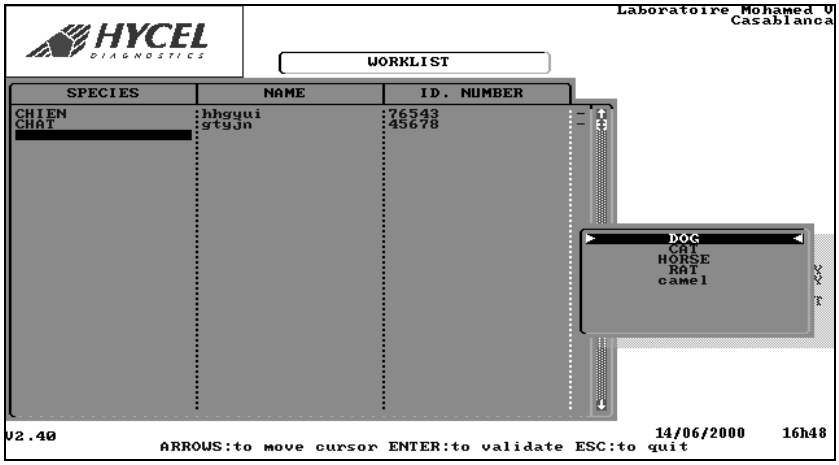
III.4.Work list F2

If CELLY is in human mode, samples are identified before counting in the work list menu with last name and/or first name and identification number.
If CELLY is in veterinary mode, samples are identified before counting in the work list menu with specie, name and identification number.
In the two cases:

- Delete identification F5
- Insert identification F6
- Print the work list F8
- Delete work list F9

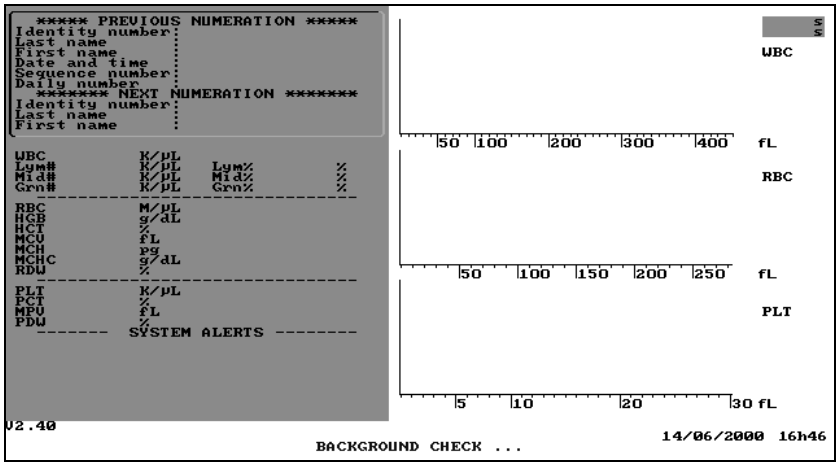
In the right column there is an indication if the sample is run or not:

- *: Sample already run
- -: Sample not run.



III.5.Run F3

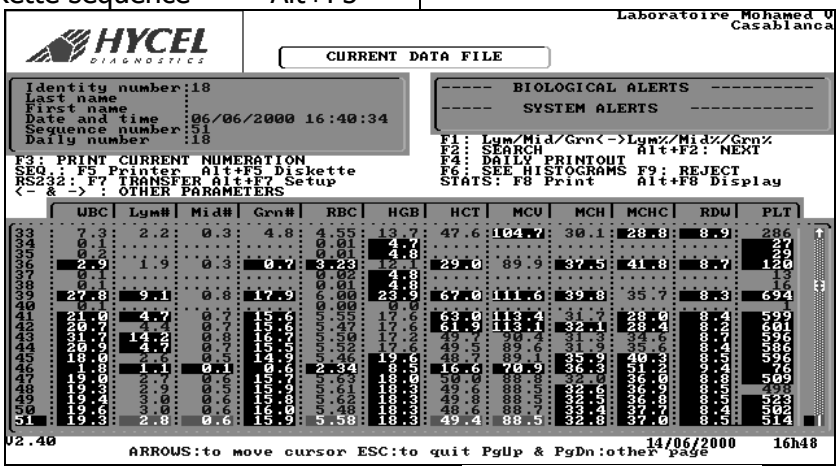
- Control/patient F1
- Specie (veterinary mode) F2
- With/without work list F3
- Rinse F4
- Recount F5
- Predilute F6
- Half-dilution F7
- Print F8
- Veterinary/human mode F9
- Platelet threshold F10
- Main menu ESC

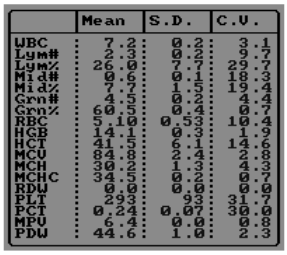


III.6.Datalog F4

III.6.1. Current file F1

- GB% → GB# F1
- Search F2
- Next Alt+F2
- Print current numeration F3
- Daily printout F4
- Print sequence F5
- Save diskette sequence Alt+F5
- See histograms F6
- Transfer RS232 F7
- Configuration RS232 Alt+F7
- Print stats F8
- See stats Alt+F8
- Reject/acceptation F9

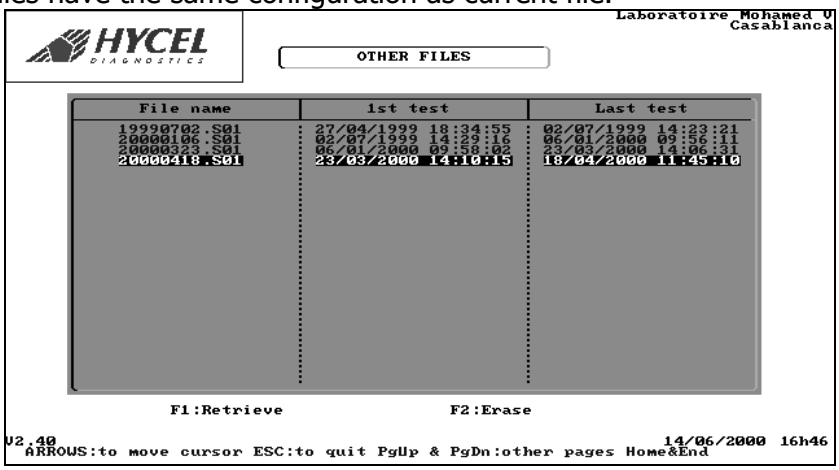

Laboratoire Mohamed V
Casablanca
CURRENT DATA FILE
Identity number:18
Last name :
First name :
Date and time :06/06/2000 16:40:34
Sequence number:51
Daily number :18
----- BIOLOGICAL ALERTS ----------
----- SYSTEM ALERTS ----------
F3: PRINT CURRENT NUMERATION
SEQ.: F5 Printer Alt+F5 Diskette
RS232: F7 TRANSFER Alt+F7 Setup
<- & ->: OTHER PARAMETERS
F1: Lym/Mid/Grn(->Lym%/Mid%/Grn%
F2: SEARCH Alt+F2: NEXT
F4: DAILY PRINTOUT
F6: SEE HISTOGRAMS F9: REJECT
STATS: F8 Print Alt+F8 Display
WBC Lym# Mid# Grn# RBC HGB HCT MCV MCH MCHC RDW PLT
ARROWS:to move cursor ESC:to quit PgUp & PgDn:other page
14/06/2000 16h48



III.6.2. Other files F2

- Retrieve F1
- Erase F2

Then these files have the same configuration as current file.

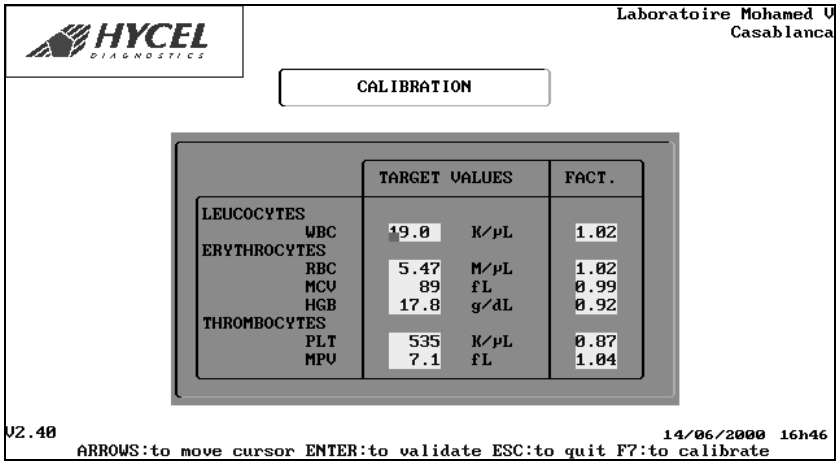


III.7.Quality F5

III.7.1. Calibration F1

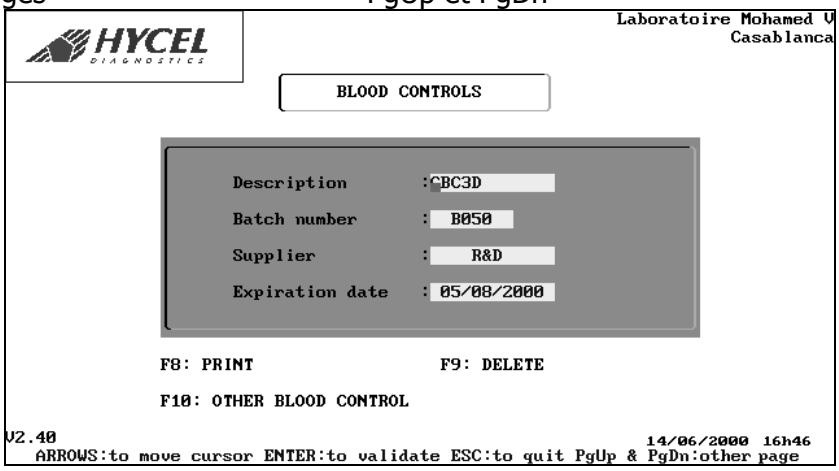
A table with the calibration targets and changeable factors.

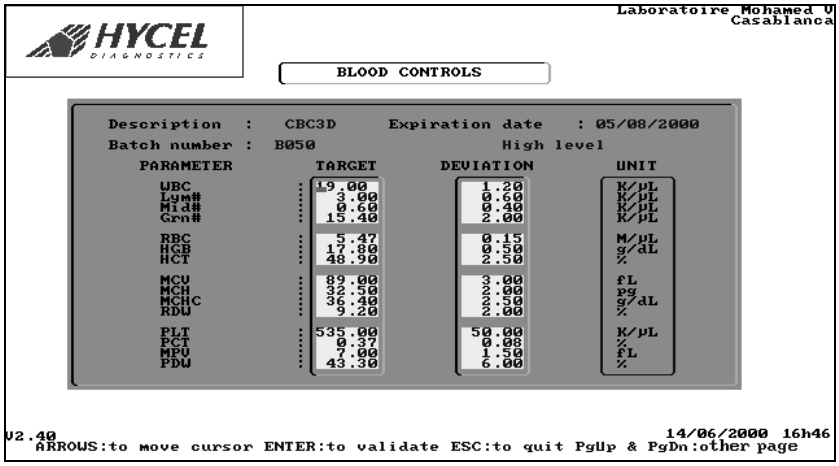
- Run calibration F7



III.7.2. Blood controls F2

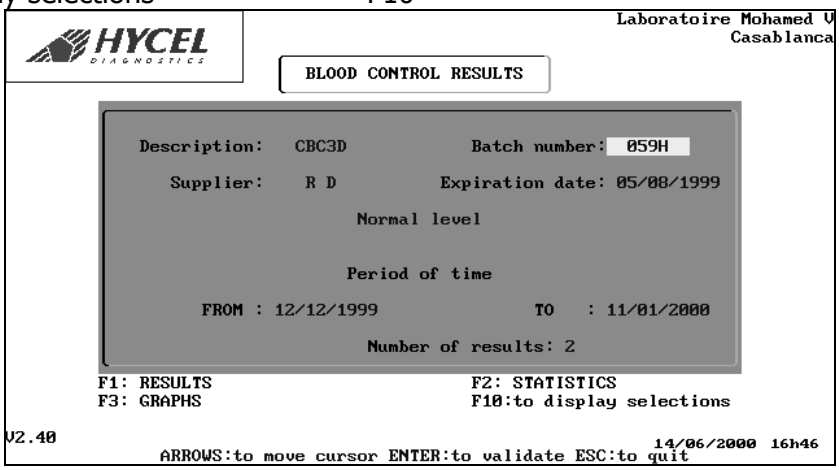
- Print F8
- Delete F9
- Other controls F10
- Other pages PgUp et PgDn

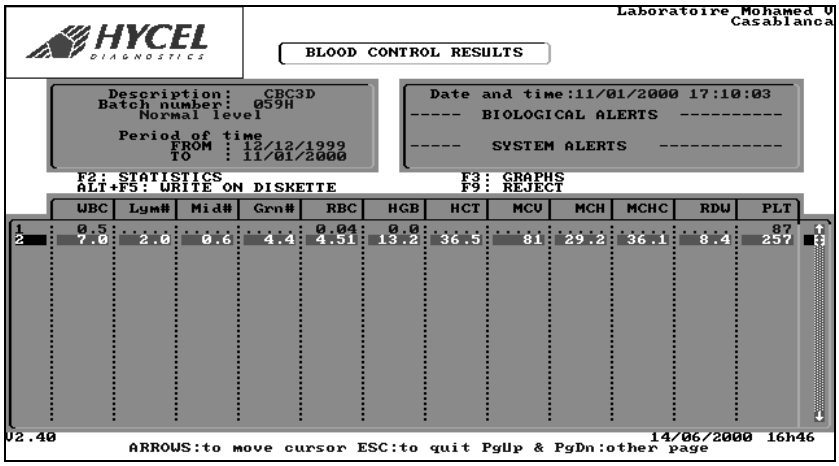


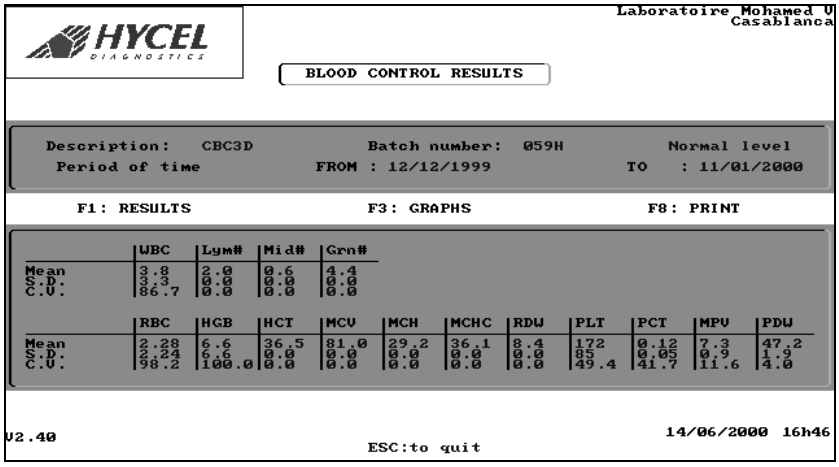

Laboratoire Mohamed V
Casablanca
BLOOD CONTROLS
Description : CBC3D Expiration date : 05/08/2000
Batch number : B050 High level
PARAMETER TARGET DEVIATION UNIT
WBC 19.00 1.20 K/µL
Lym# 3.00 0.60 K/µL
Mid# 0.60 0.40 K/µL
Grn# 15.40 2.00 K/µL
RBC 5.47 0.15 M/µL
HGB 17.80 0.50 g/dL
HCT 48.90 2.50 %
MCV 89.00 3.00 fL
MCH 32.50 2.00 pg
MCHC 36.40 2.50 g/dL
RDW 9.20 2.00 %
PLT 535.00 50.00 K/µL
PCT 0.37 0.08 %
MPV 7.00 1.50 fL
PDW 43.30 6.00 %
V2.40
14/06/2000 16h46
ARROWS:to move cursor ENTER:to validate ESC:to quit PgUp & PgDn:other page

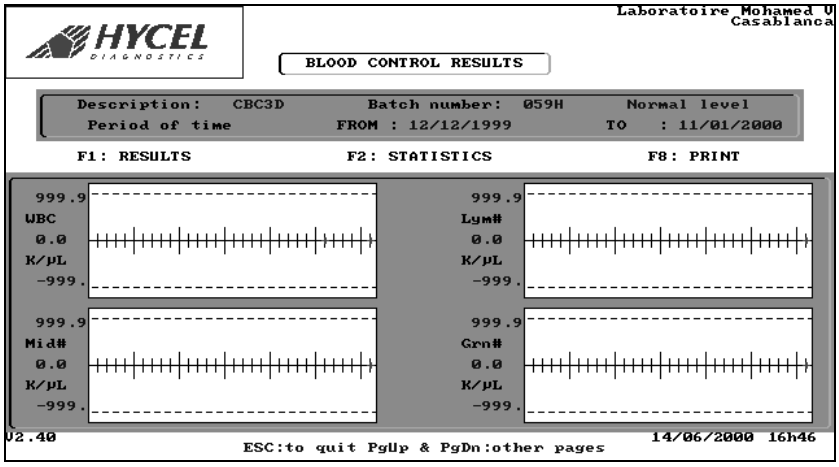
III.7.3. Blood control results F3

- Results F1
- Statistics F2
- Graphs F3
- To display selections F10



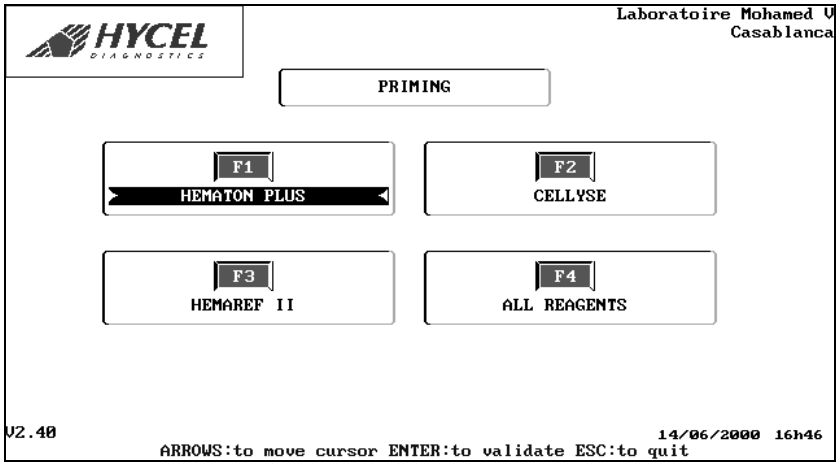

Laboratoire Mohamed V
Casablanca
BLOOD CONTROL RESULTS
Description: CBC3D
Batch number: 059H
Normal level
Period of time
FROM : 12/12/1999
TO : 11/01/2000
Date and time:11/01/2000 17:10:03
----- BIOLOGICAL ALERTS ----------
----- SYSTEM ALERTS ----------
F2: STATISTICS
ALT+F5: WRITE ON DISKETTE
F3: GRAPHS
F9: REJECT
WBC Lym# Mid# Grn# RBC HGB HCT MCV MCH MCHC RDW PLT
1 0.5 0.04 0.0 87
2 7.0 2.0 0.6 4.4 4.51 13.2 36.5 81 29.2 36.1 8.4 257
V2.40
14/06/2000 16h46
ARROWS:to move cursor ESC:to quit PgUp & PgDn:other page


Laboratoire Mohamed V
Casablanca
BLOOD CONTROL RESULTS
Description: CBC3D
Batch number: 059H
Normal level
Period of time
FROM : 12/12/1999
TO : 11/01/2000
F1: RESULTS
F3: GRAPHS
F8: PRINT
WBC Lym# Mid# Grn#
Mean 3.8 2.0 0.6 4.4
S.D. 3.3 0.0 0.0 0.0
C.V. 86.7 0.0 0.0 0.0
RBC HGB HCT MCV MCH MCHC RDW PLT PCT MPV PDW
Mean 2.28 6.6 36.5 81.0 29.2 36.1 8.4 172 0.12 7.3 47.2
S.D. 2.24 6.6 0.0 0.0 0.0 0.0 0.0 85 0.05 0.9 1.9
C.V. 98.2 100.0 0.0 0.0 0.0 0.0 0.0 49.4 41.7 11.6 4.0
V2.40
14/06/2000 16h46
ESC:to quit



III.8.Priming F6

- Hematon plus F1
- Cellyse F2
- Hemaref II F3
- All reagents F4

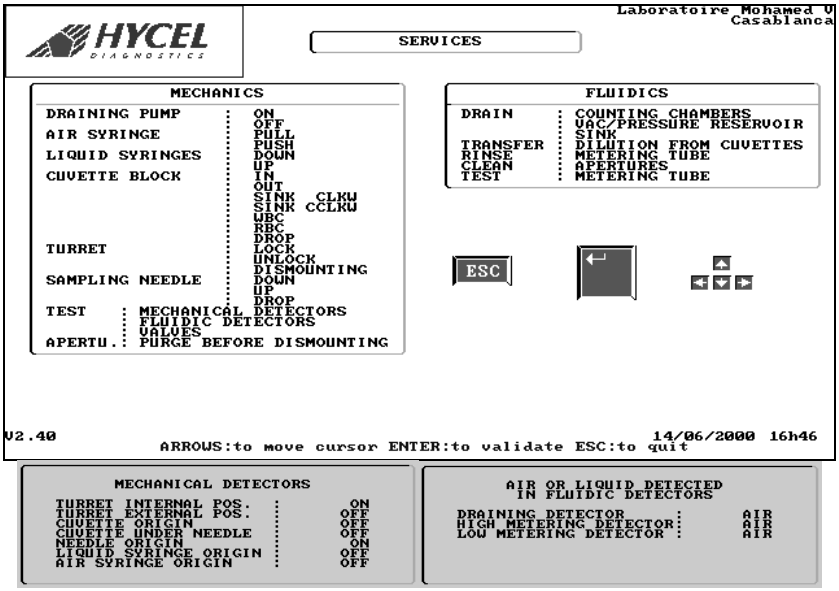


III.9.Service F7

III.9.1. Service F1

Mechanical and fluidic tests are available.

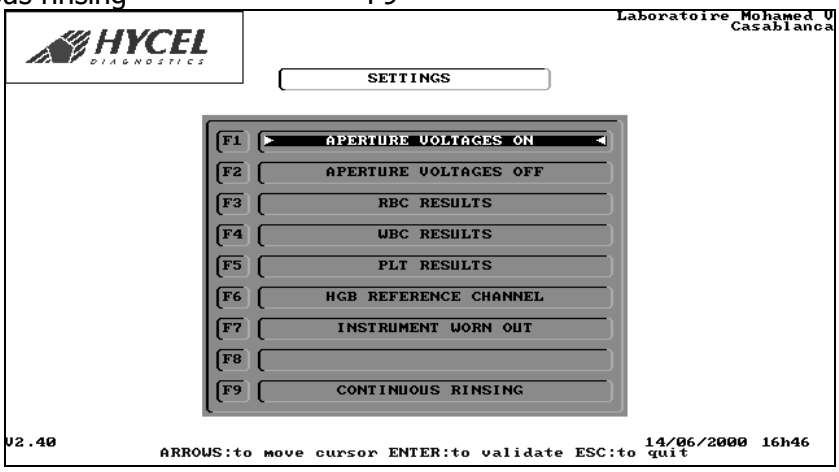
- Draining pump (On/Off)
- Air syringe (vacuum/pressure) (pull/push)
- Liquid syringes (pull/push)
- Cuvette (in, out, sink, WBC, RBC and drop))
- Turret (lock, unlock and dismounting)
- Sampling needle (down, up and drop)
- Test (mechanical detectors, fluidic detectors et valves)
- Apertures: purge before dismounting
- Drain (counting chambers, vac/pressure reservoir et sink)
- Transfer: dilution from cuvettes
- Rinse metering tube
- Clean apertures
- Test metering tube

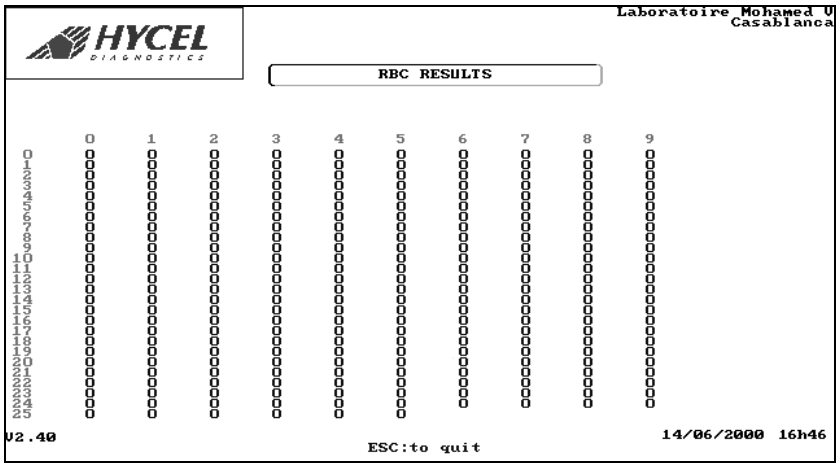

Laboratoire Mohamed V
Casablanca
SERVICES
MECHANICS
DRAINING PUMP : ON / OFF
AIR SYRINGE : PULL / PUSH
LIQUID SYRINGES : DOWN / UP
CUVETTE BLOCK : IN / OUT / SINK CLKW / SINK CCLKW / WBC / RBC / DROP
TURRET : LOCK / UNLOCK / DISMOUNTING
SAMPLING NEEDLE : DOWN / UP / DROP
TEST : MECHANICAL DETECTORS / FLUIDIC DETECTORS / VALVES
APERTU. : PURGE BEFORE DISMOUNTING
FLUIDICS
DRAIN : COUNTING CHAMBERS / VAC/PRESSURE RESERVOIR / SINK
TRANSFER : DILUTION FROM CUVETTES
RINSE : METERING TUBE
CLEAN : APERTURES
TEST : METERING TUBE
ESC
V2.40
14/06/2000 16h46
ARROWS:to move cursor ENTER:to validate ESC:to quit
MECHANICAL DETECTORS
TURRET INTERNAL POS. : ON
TURRET EXTERNAL POS. : OFF
CUVETTE ORIGIN : OFF
CUVETTE UNDER NEEDLE : OFF
NEEDLE ORIGIN : ON
LIQUID SYRINGE ORIGIN : OFF
AIR SYRINGE ORIGIN : OFF
AIR OR LIQUID DETECTED IN FLUIDIC DETECTORS
DRAINING DETECTOR : AIR
HIGH METERING DETECTOR : AIR
LOW METERING DETECTOR : AIR

III.9.2. Settings F2

Password: 2004

- Aperture voltages ON F1
- Aperture voltages OFF F2
- RBC results F3
- WBC results F4
- PLT results F5
- HGB reference channel F6
- Instrument worn out F7
- Continuous rinsing F9

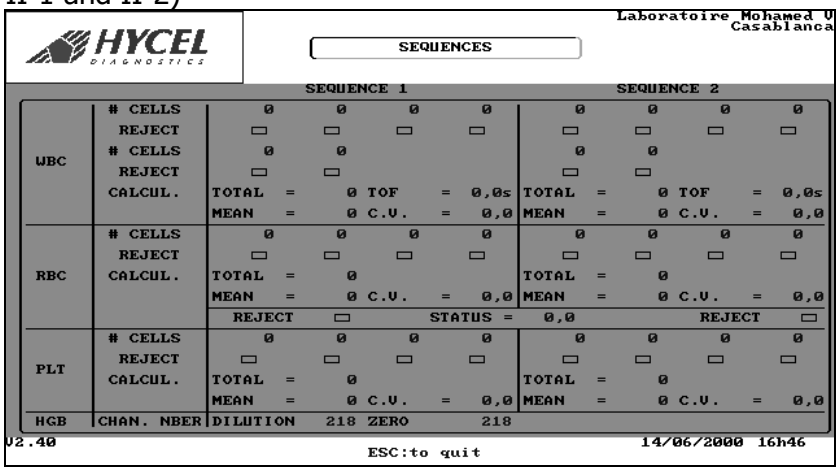




There are the same tables for the WBC and the PLT. They help to check the blood count on the 256 channels.

III.9.3. Sequences F3

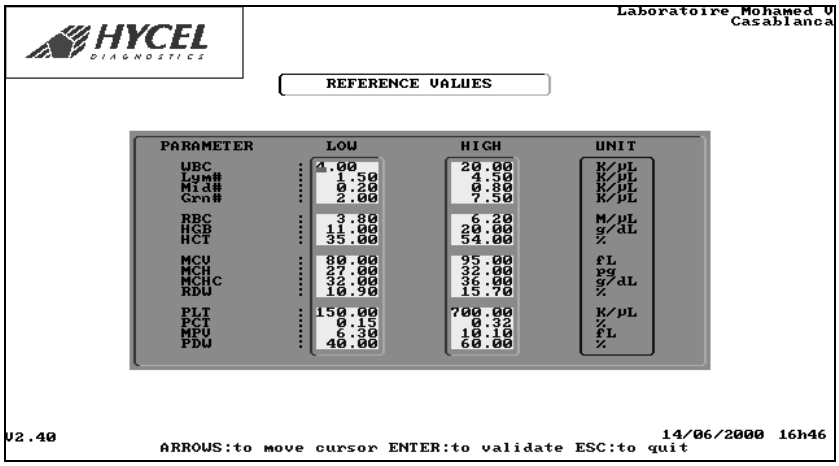
Password: 2004
(See pages II-1 and II-2)



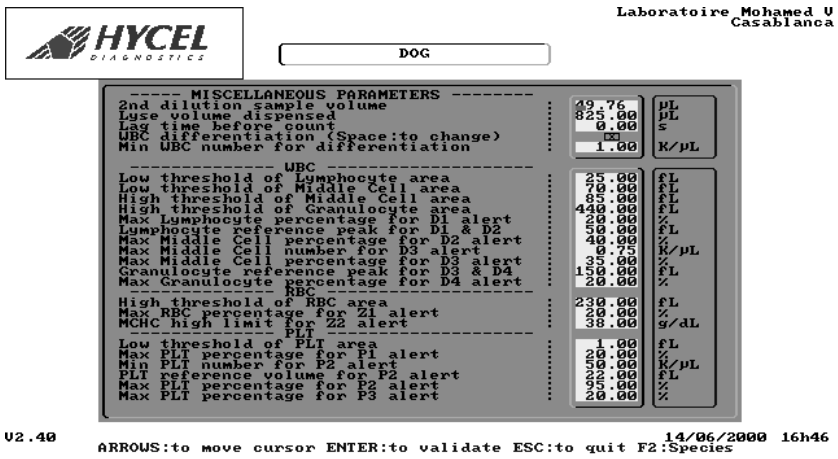
III.10.Setup F8

III.10.1. Reference values F1

In veterinary mode choose the specie, and enter or change the reference values.

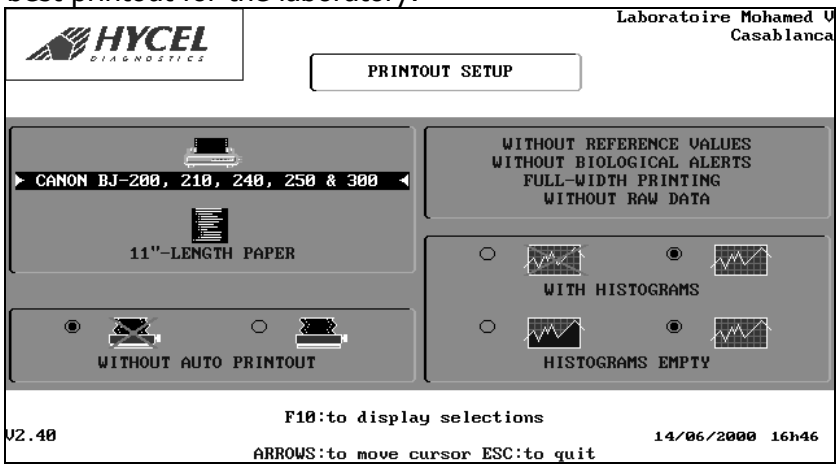


- F1: Hidden menu with setup for veterinary mode (lysing agent volume, time before count, threshold min and max)


Laboratoire Mohamed V
Casablanca
DOG
----- MISCELLANEOUS PARAMETERS --------
2nd dilution sample volume 49.76 µL
Lyse volume dispensed 825.00 µL
Lag time before count 0.00 s
WBC differentiation (Space:to change) X
Min WBC number for differentiation 1.00 K/µL
---------- WBC ----------
Low threshold of Lymphocyte area 25.00 fL
Low threshold of Middle Cell area 70.00 fL
High threshold of Middle Cell area 85.00 fL
High threshold of Granulocyte area 440.00 fL
Max Lymphocyte percentage for D1 alert 20.00 %
Lymphocyte reference peak for D1 & D2 50.00 fL
Max Middle Cell percentage for D2 alert 40.00 %
Max Middle Cell number for D3 alert 0.75 K/µL
Max Middle Cell percentage for D3 alert 35.00 %
Granulocyte reference peak for D3 & D4 150.00 fL
Max Granulocyte percentage for D4 alert 20.00 %
---------- RBC ----------
High threshold of RBC area 230.00 fL
Max RBC percentage for Z1 alert 20.00 %
MCHC high limit for Z2 alert 38.00 g/dL
---------- PLT ----------
Low threshold of PLT area 1.00 fL
Max PLT percentage for P1 alert 20.00 %
Min PLT number for P2 alert 50.00 K/µL
PLT reference volume for P2 alert 22.00 fL
Max PLT percentage for P2 alert 35.00 %
Max PLT percentage for P3 alert 20.00 %
V2.40
14/06/2000 16h46
ARROWS:to move cursor ENTER:to validate ESC:to quit F2:Species

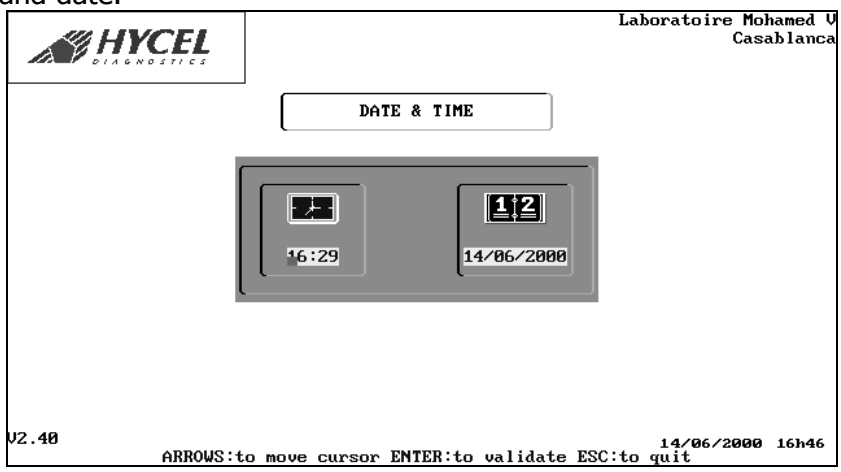
III.10.2. Printout setup F2

Choose the best printout for the laboratory.



III.10.3. Date and time F3

Enter time and date.



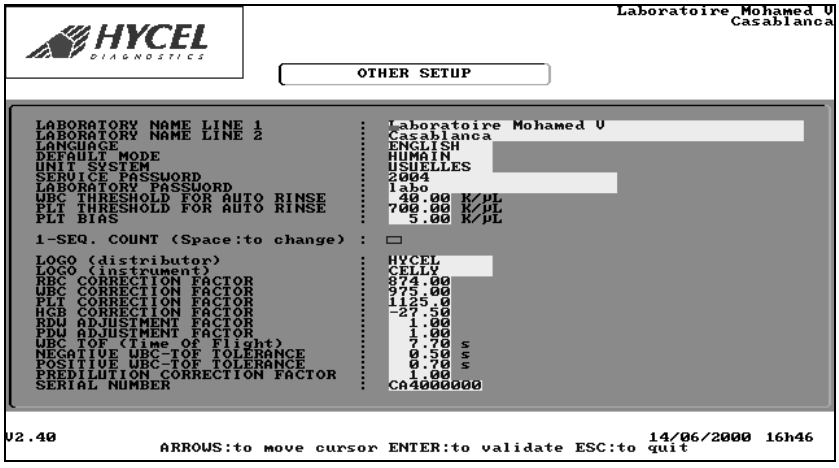
III.10.4. Other setup F4

Password: 2004

- Heading of the printout (laboratory name)
- Language
- Mode (Veterinary or human)
- Units:

Usual units	K/mm^3	M/mm^3	g/dL
SI 2	Giga/L	Tera/L	g/L

- Service password: 2004
- Laboratory password: labo
- WBC threshold for auto rinse (WBC > 25000)
- PLT threshold for auto rinse (PLT > 999000). This rinse avoids all contamination between samples.
- PLT bias
- 1 or 2 counting sequences
- Logos
- Correction factors (RBC, WBC, PLT, HGB, RDW, PDW, predilution)
- TOF: Time of Flight = counting time
  Negative tolerance: -0,5 s (alarm S5)
  Positive tolerance: +0,7 s (alarm S6)
- Serial number


HYCEL
DIAGNOSTICS
Laboratoire Mohamed V
Casablanca
OTHER SETUP
LABORATORY NAME LINE 1 : Laboratoire Mohamed V
LABORATORY NAME LINE 2 : Casablanca
LANGUAGE : ENGLISH
DEFAULT MODE : HUMAIN
UNIT SYSTEM : USUELLES
SERVICE PASSWORD : 2004
LABORATORY PASSWORD : labo
WBC THRESHOLD FOR AUTO RINSE : 40.00 K/µL
PLT THRESHOLD FOR AUTO RINSE : 700.00 K/µL
PLT BIAS : 5.00 K/µL
1-SEQ. COUNT (Space:to change) :
LOGO (distributor) : HYCEL
LOGO (instrument) : CELLY
RBC CORRECTION FACTOR : 874.00
WBC CORRECTION FACTOR : 975.00
PLT CORRECTION FACTOR : 1125.0
HGB CORRECTION FACTOR : -27.50
RDW ADJUSTMENT FACTOR : 1.00
PDW ADJUSTMENT FACTOR : 1.00
WBC TOF (Time of Flight) : 7.70 s
NEGATIVE WBC-TOF TOLERANCE : 0.50 s
POSITIVE WBC-TOF TOLERANCE : 0.70 s
PREDILUTION CORRECTION FACTOR : 1.00
SERIAL NUMBER : CA4000000
V2.40
14/06/2000 16h46
ARROWS:to move cursor ENTER:to validate ESC:to quit

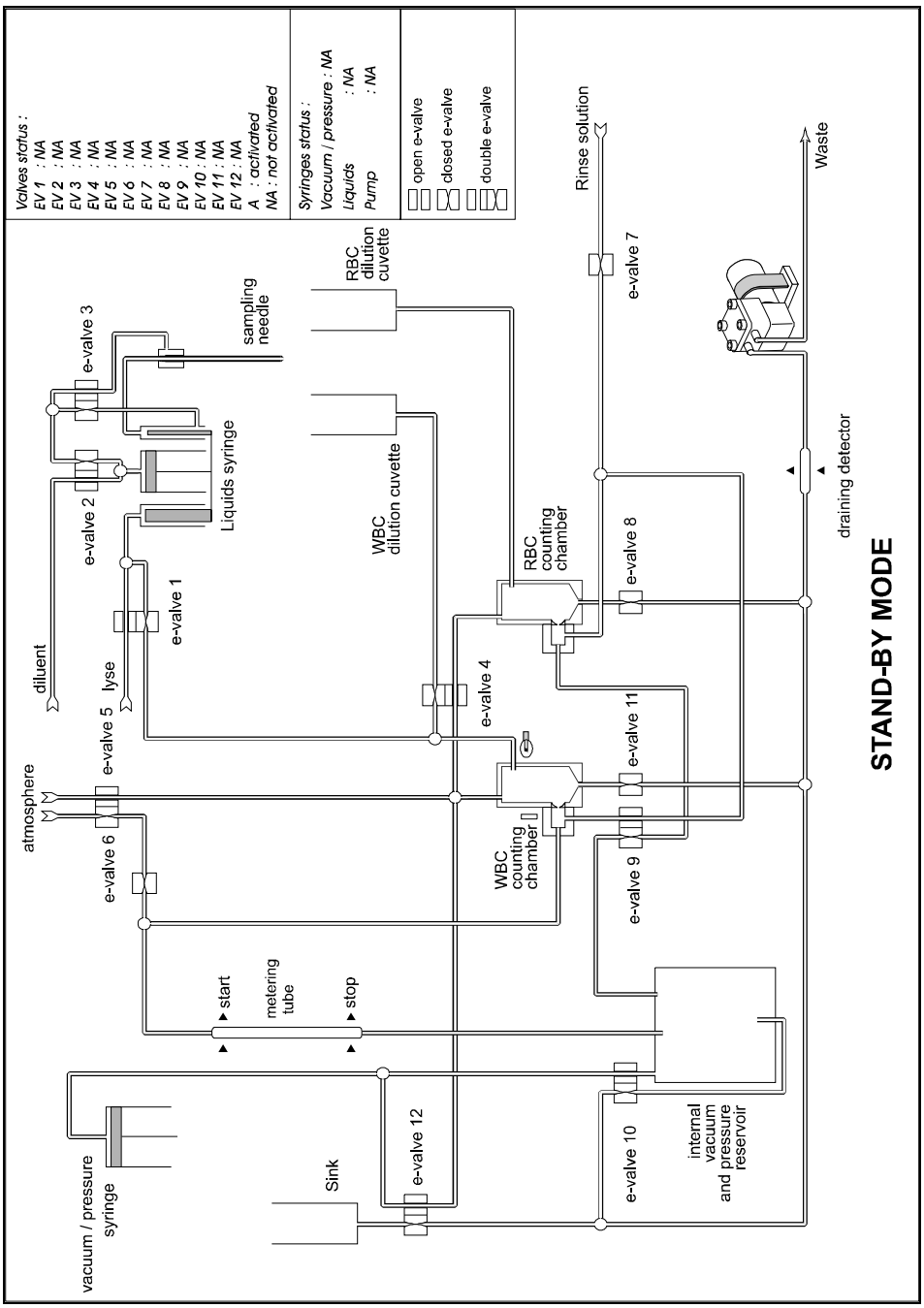
The distributor logo can be change, put your logo in a BMP format with shape 184x56 pixels and 16 colors. Place it in the directory: C:\HYCEL\BMP.
For changing the instrument logo, put your logo in BMP format with shape 240x80 pixels and 16 colors. Place it in the directory: C:\HYCEL\BMP.
The software automatically suggests the files in the good format (F10).

IV Fluidic cycles description

Fluidic cycles are quite difficult to describe as many operations happen simultaneously.
The comprehension of the cycles is essential for the CELLY maintenance. As all hematological counters, the leakages and the blocking are the main causes of the dysfunction of the CELLY.

IV.1.Mode stand-by

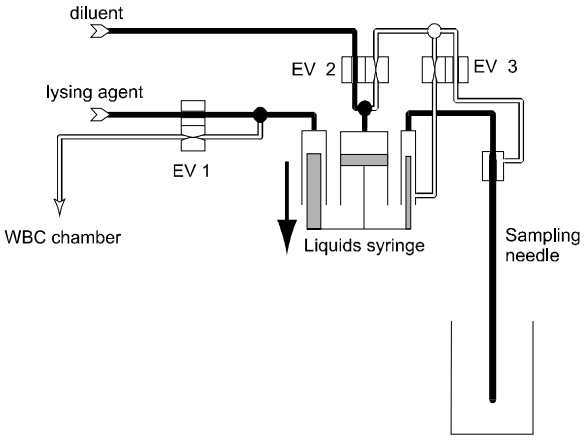
- All syringes, pump and valves are inactivated.
- Counting chambers are empty unless an automatic rinse has been done. In such a case, they are half full with diluent.
- Dilution cuvettes and sink are empty.



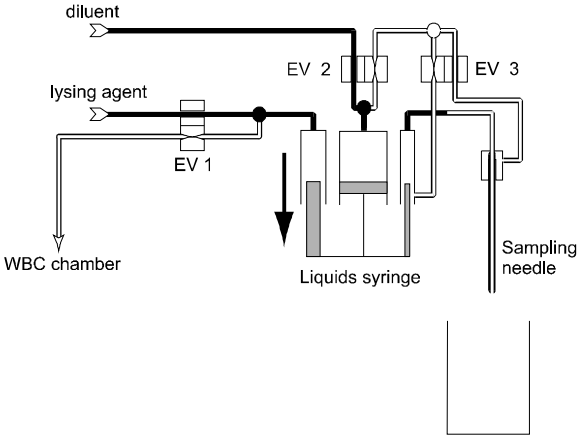
IV.2.Sample aspiration

In case counting chambers are full with diluent (e.g.: after an automatic rinse), they are drained first .

- Blood tube is positioned under the sampling needle and turret is locked.
- Sampling needle moves down.
- Liquid syringes move down to aspirate sample, red and green leds flicker.
- Needle moves up.
- The sample is return to the user. When the red led is on, the turret is locked
- Red led lights up during all dilution, counting and rinsing cycle.
- Liquid syringes continue their movement down to aspirate the appropriate volume of diluent



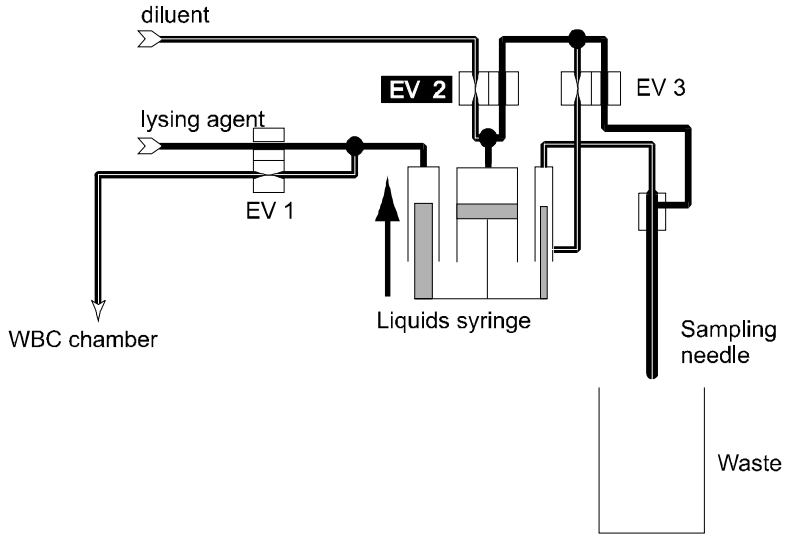
Sample aspiration



Diluent aspiration

IV.3.External needle rinsing

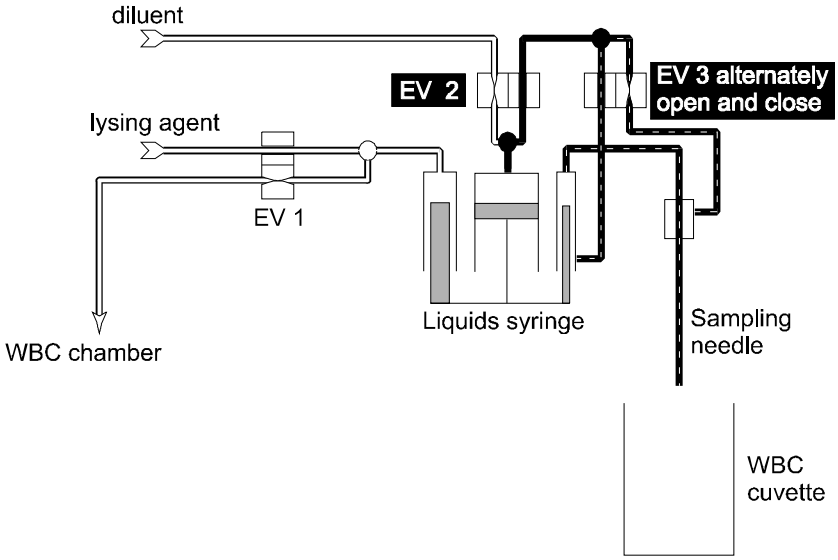
- Sink is positioned under the sampling needle
- Needle moves down.
- Electrovalve V2 is activated.
- Liquid syringes move up to push diluent (1.5 cc).
- Needle moves up and shake the diluent drop.



External needle rinsing

IV.4.First dilution

- WBC cuvette is positioned under the sampling needle.
- Electrovalve V2 is activated .
- Liquid syringes move up to pour 7 ml of diluent.
- Electrovalve V3 is alternatively open or closed to push diluent inside or outside the needle to provide effective mixing of the dilution.
- V2 is deactivated.
- Sampling needle moves up to get rid of the diluent drop in the first dilution and then moves up.

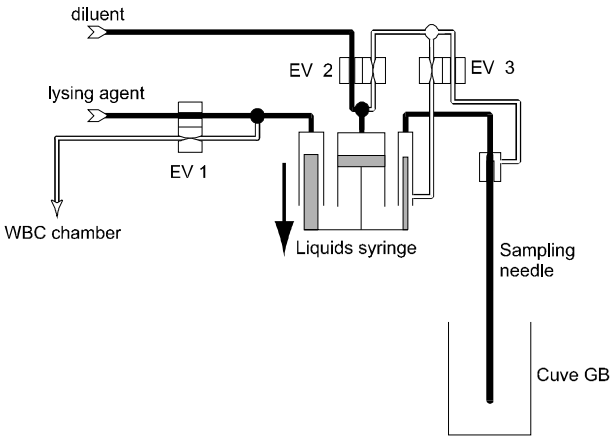


First dilution

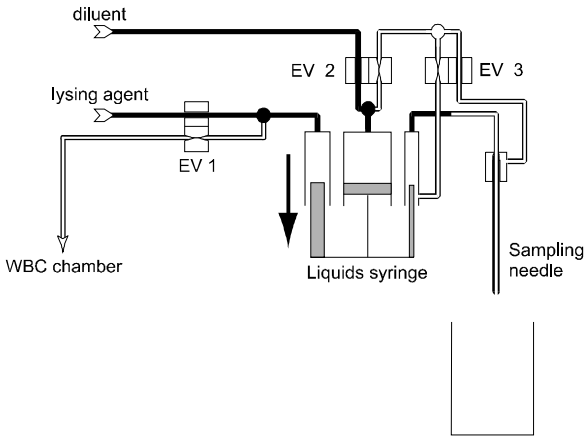
IV.5.Second aspiration

- Sampling needle moves down to the bottom of the WBC cuvette.
- Liquid syringes move down to aspirate the appropriate volume from the 1st dilution.
- Sampling needle moves up and shake the diluent drop.
- Liquid syringes carry on their movement upwards to aspirate diluent.

Second aspiration



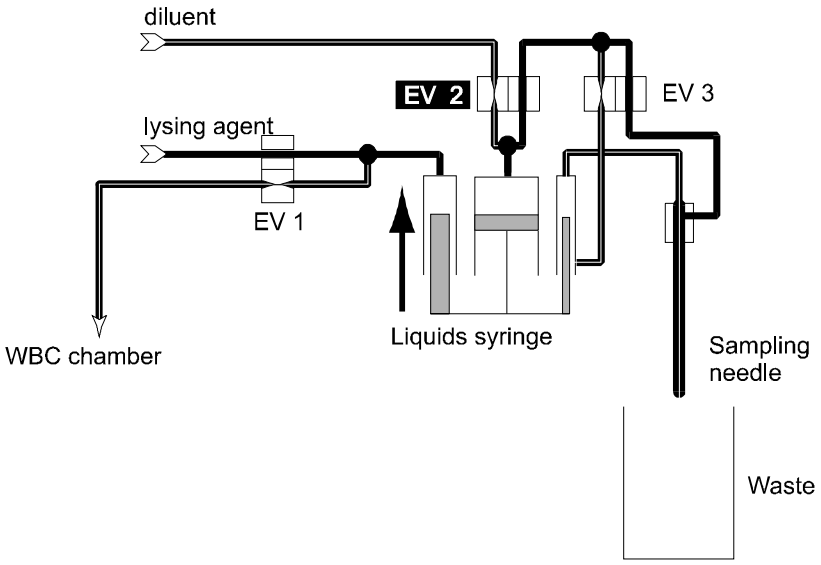
First dilution aspiration



Diluent aspiration

IV.6.Second external needle rinsing

- Sink is positioned under the sampling needle.
- Liquid syringes move down to push 1.5 cc of diluent outside the needle to rinse it.



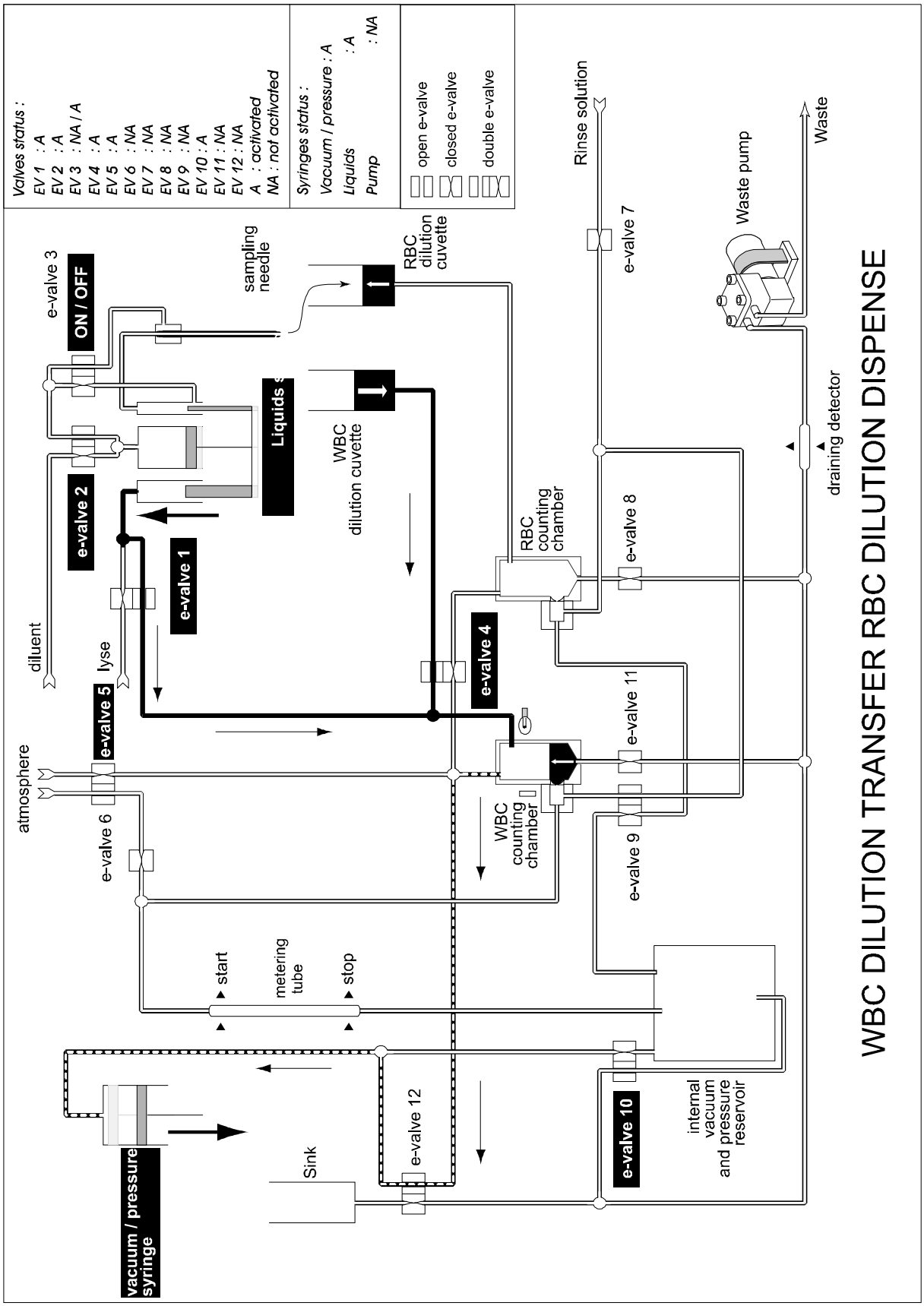
External needle rinsing

IV.7.Second dilution and WBC dilution transfer

- RBC cuvette is positioned under the sampling needle.
- Electrovalve V2 is activated.
- Liquid syringes move up to push 8 ml of diluent.
- Electrovalve V3 is alternatively activated to ensure a proper mixing of the dilution.

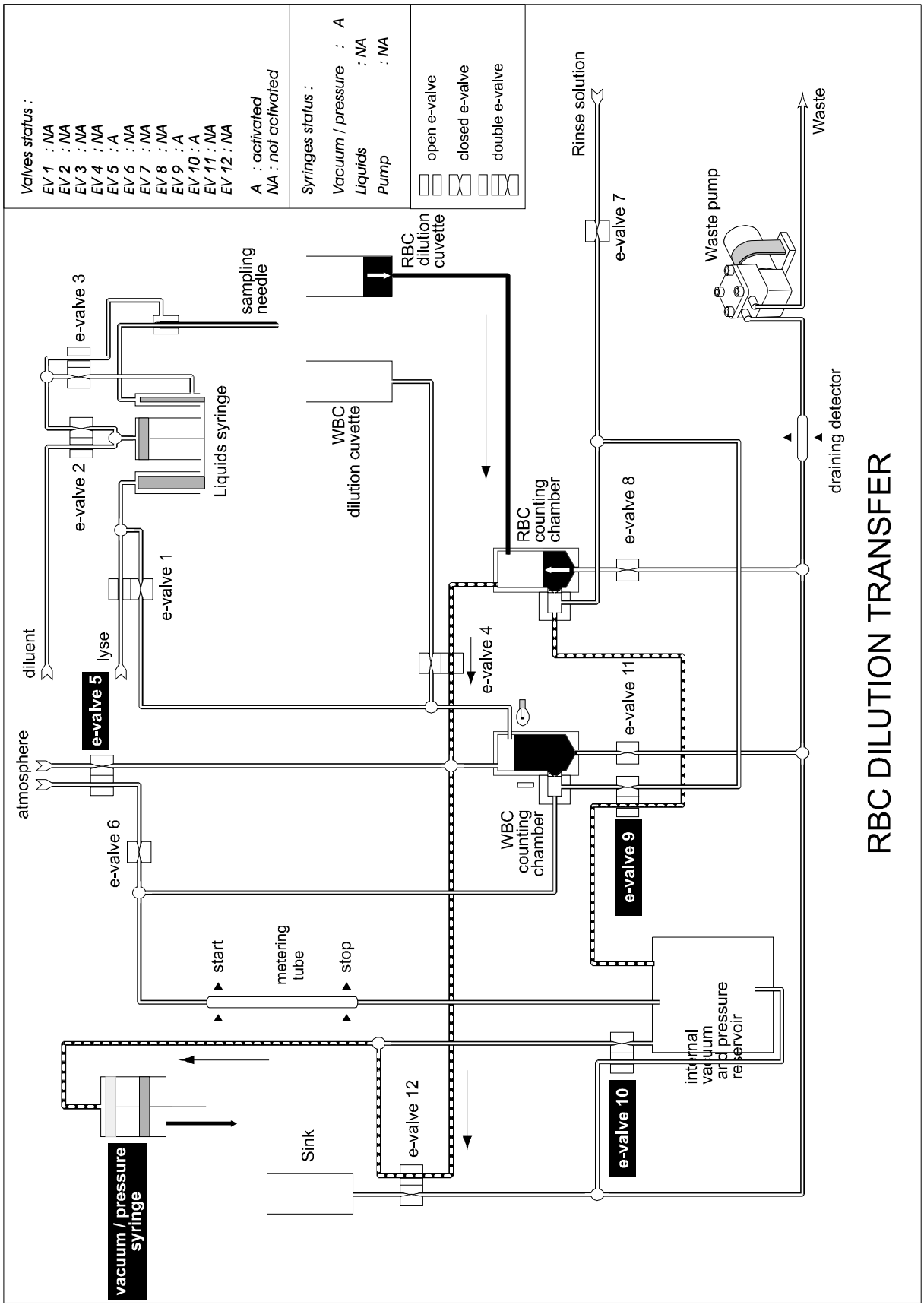
Simultaneously,

- Electrovalve V4 is activated to select WBC transfer only.
- Electrovalve V1 is activated to dispense lyse.
- Electrovalve V5 is activated to « seal » the WBC chamber.
- Electrovalve V10 is activated to « seal» the internal vacuum and pressure reservoirs.
- Air syringe moves down to provide vacuum in the WBC chamber.
- WBC dilution is transferred from WBC cuvette to the WBC counting chamber and lysing agent is added. The mixing WBC dilution and lysing agent is done in the "T" n° 27 (see pages VI-2 and VI-4). The injection of this mixing in the counting chamber is done tangentially. This mixing/homogenization is essential for a good numeration, a good differentiation and a good measurement of hemoglobin.
- V4 is deactivated.


Valves status :
EV 1 : A
EV 2 : A
EV 3 : NA / A
EV 4 : A
EV 5 : A
EV 6 : NA
EV 7 : NA
EV 8 : NA
EV 9 : NA
EV 10 : A
EV 11 : NA
EV 12 : NA
A : activated
NA : not activated
Syringes status :
Vacuum / pressure : A
Liquids : A
Pump : NA
open e-valve
closed e-valve
double e-valve
WBC DILUTION TRANSFER RBC DILUTION DISPENSE
e-valve 3
ON / OFF
sampling needle
RBC dilution cuvette
Rinse solution
e-valve 7
Waste pump
Waste
Liquids
WBC dilution cuvette
e-valve 2
e-valve 1
RBC counting chamber
e-valve 8
draining detector
diluent
lyse
e-valve 4
e-valve 5
e-valve 11
atmosphere
WBC counting chamber
e-valve 6
e-valve 9
start
metering tube
stop
internal vacuum and pressure reservoir
e-valve 12
e-valve 10
Sink
vacuum / pressure syringe

IV.8.RBC dilution transfer

- V5 is activated to « seal » the counting chamber.
- Electrovalve V9 is activated to avoid that WBC dilution may be aspirated from the WBC chamber towards the RBC chamber.
- V10 is activated.
- Waste pump is activated for a very short time to balance vacuum between internal vacuum reservoir and RBC counting chamber.
- Air syringe pull to aspirate RBC dilution in the counting chamber.


Valves status :
EV 1 : NA
EV 2 : NA
EV 3 : NA
EV 4 : NA
EV 5 : A
EV 6 : NA
EV 7 : NA
EV 8 : NA
EV 9 : A
EV 10 : A
EV 11 : NA
EV 12 : NA
A : activated
NA : not activated
Syringes status :
Vacuum / pressure : A
Liquids : NA
Pump : NA
open e-valve
closed e-valve
double e-valve
RBC DILUTION TRANSFER
Rinse solution
e-valve 7
Waste
Waste pump
draining detector
RBC dilution cuvette
sampling needle
e-valve 3
Liquids syringe
e-valve 2
WBC dilution cuvette
RBC counting chamber
e-valve 8
e-valve 1
diluent
lyse
e-valve 5
e-valve 4
e-valve 11
atmosphere
WBC counting chamber
e-valve 9
e-valve 6
start
metering tube
stop
internal vacuum and pressure reservoir
Sink
e-valve 12
e-valve 10
vacuum / pressure syringe

IV.9.WBC line rinse

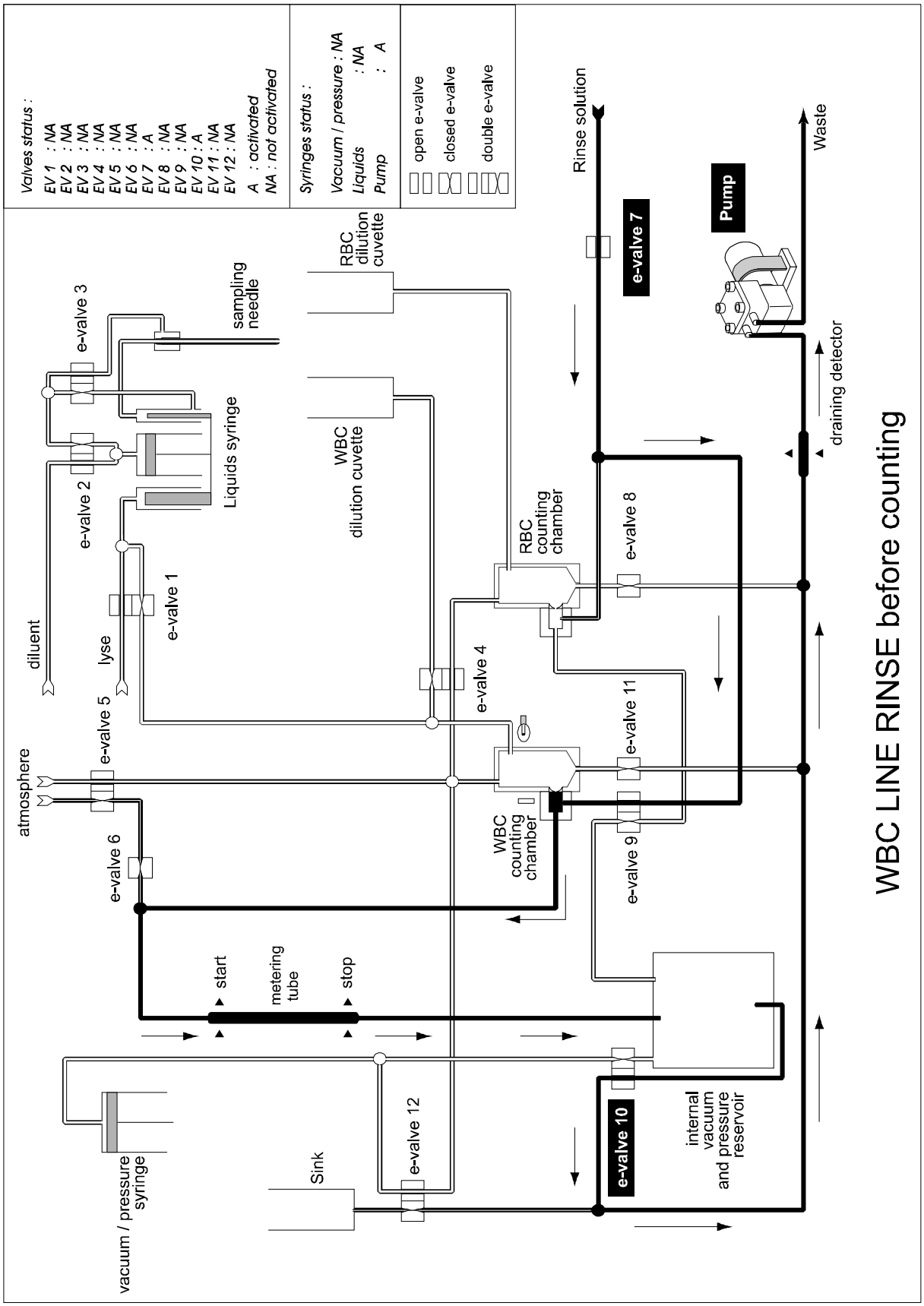
- V10 is activated.
- Waste pump is activated.
- V7 is activated.

Detergent is aspirated through the WBC aspiration line to fill it with liquid before the count starts.

- V6 is activated.
- V5 is activated.

To purge the line between V6 and the metering tube.

- V12 is activated to empty the sink


Valves status :
EV 1 : NA
EV 2 : NA
EV 3 : NA
EV 4 : NA
EV 5 : NA
EV 6 : NA
EV 7 : A
EV 8 : NA
EV 9 : NA
EV 10 : A
EV 11 : NA
EV 12 : NA
A : activated
NA : not activated
Syringes status :
Vacuum / pressure : NA
Liquids : NA
Pump : A
open e-valve
closed e-valve
double e-valve
WBC LINE RINSE before counting
Rinse solution
Waste
Pump
e-valve 7
draining detector
RBC dilution cuvette
sampling needle
e-valve 3
WBC dilution cuvette
Liquids syringe
e-valve 2
RBC counting chamber
e-valve 8
diluent
lyse
e-valve 1
e-valve 4
e-valve 5
e-valve 11
atmosphere
WBC counting chamber
e-valve 6
e-valve 9
start
metering tube
stop
internal vacuum and pressure reservoir
e-valve 10
Sink
e-valve 12
vacuum / pressure syringe

IV.10.First dilution cuvette rinsing

8cc of diluent are poured in each of the WBC and RBC dilution cuvettes to ensure a first rinsing.

IV.11.Sink draining

- Waste pump activated.
- V12 is activated.

IV.12.Summary of the first phases

Phase	Syringes	Needle	Turret	EV1	EV2	EV3
Sample aspiration	Aspiration 32µL					
	Charge 11mL					
		Max up				
External needle rinsing			Init.-->rinsing			
		Down 40mm				
	3mL ext. needle				A	
Première dilution		Up 15mm				
			rinsing-->WBC			
		Down 15mm				
	2mL ext. needle				A	
		Up 5mm				
	2mL int. needle				A	A
	1,5mL ext. needle				A	
		Up 5mm				
	1,5mL int. needle				A	A
drop		Down 15mm				
		Up 15mm				
Sampling 1st dilution		Down 23mm				
	Sampling 43,7µL					
		Up 29mm				
	charge 10mL					
External needle rinsing			WBC-->rinsing			
	1,5mL ext. needle				A	
Second dilution			rinsing-->WBC			
		Down 9mm				
	Ask for transferring WBC and lysing agent					
	6,5mL ext. needle			A	A	
	1,5mL int. needle			A	A	A
WBC cuvette rinsing		Up 5mm				
	charge 7mL					
			GR-->GB			
	7mL ext. needle				A	
	Ask for transferring RBC					
RBC cuvette rinsing	charge 7mL					
			GB-->GR			
	6mL ext. needle				A	
	1mL int. needle				A	A
	Ask for counting cycle					
Waiting end of counting	to switch					
			GR-->rinsing			
		Down 20mm				

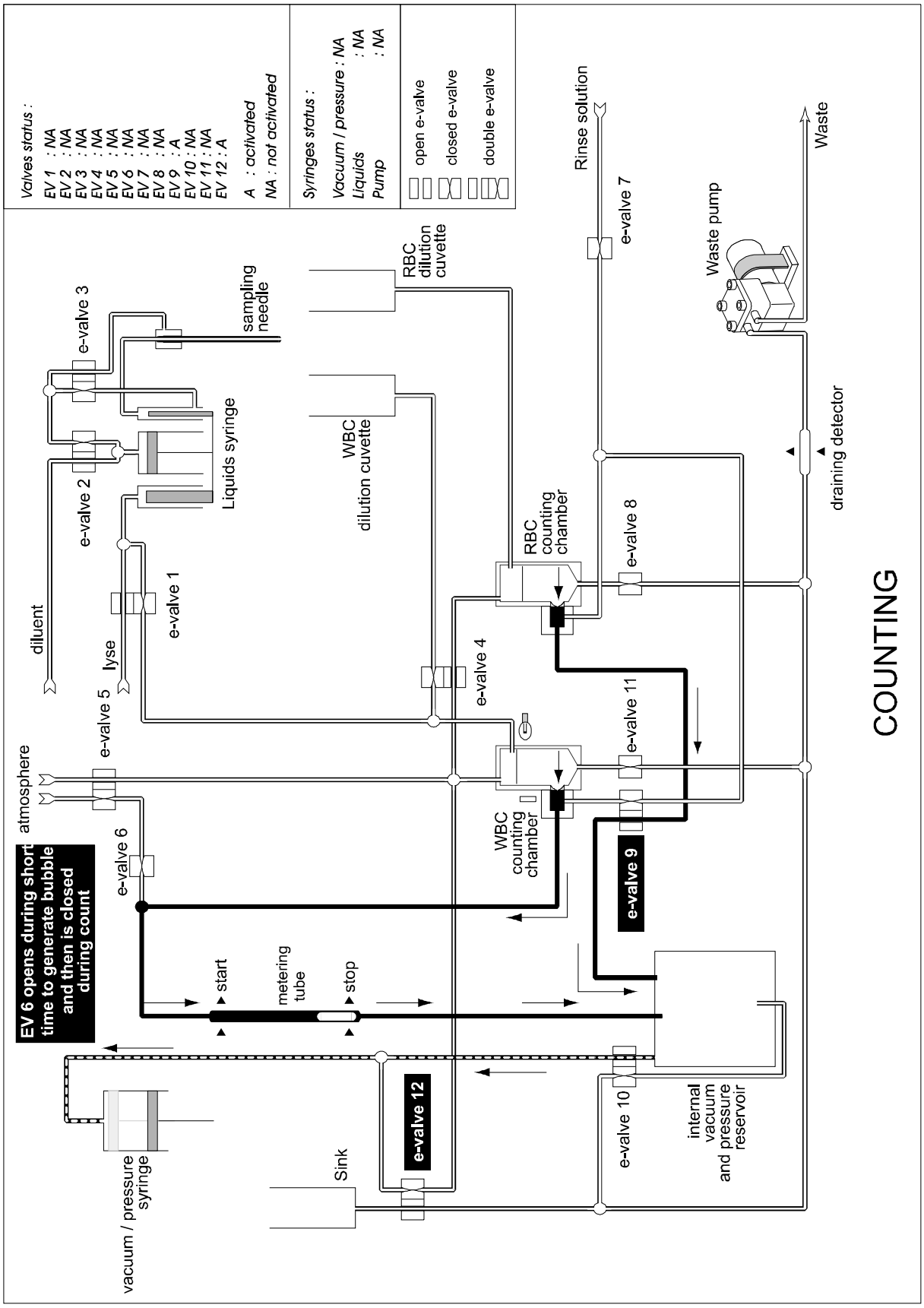
IV.13.Counting

- V12 is activated.
- Air syringe moves down to build vacuum in the internal vacuum/pressure reservoir.
- V9 is activated to provide vacuum to the RBC orifice.
- V5 and V6 are activated for a very short time to generate the detection bubble.

The count starts when the bubble passes in front of the upper metering tube detector and stops when it passes in front of the bottom detector.
Vacuum is about 4.8" Hg at the beginning of the count. The vacuum loss at the end of the first sequence is about 0.15" Hg. The air syringe moves down after the first sequence to compensate the vacuum loss.

If the TOF (time of flight) is too short, a rinsing of the WBC line is performed.
If the TOF is too long, a backflush is done and a message (S0) is displayed.

Note : The vacuum reserve is constituted by the vacuum bottle and the air syringe. The syringe motor is switch on to avoid all movement of the piston. But it can generate an overheating, which give a bad vacuum.


Valves status :
EV 1 : NA
EV 2 : NA
EV 3 : NA
EV 4 : NA
EV 5 : NA
EV 6 : NA
EV 7 : NA
EV 8 : NA
EV 9 : A
EV 10 : NA
EV 11 : NA
EV 12 : A
A : activated
NA : not activated
Syringes status :
Vacuum / pressure : NA
Liquids : NA
Pump : NA
open e-valve
closed e-valve
double e-valve
COUNTING
Rinse solution
Waste
e-valve 7
Waste pump
draining detector
RBC dilution cuvette
sampling needle
e-valve 3
WBC dilution cuvette
Liquids syringe
e-valve 2
RBC counting chamber
e-valve 8
diluent
e-valve 1
lyse
e-valve 5
e-valve 4
e-valve 11
atmosphere
WBC counting chamber
e-valve 6
EV 6 opens during short time to generate bubble and then is closed during count
e-valve 9
start
metering tube
stop
vacuum / pressure syringe
Sink
e-valve 12
e-valve 10
internal vacuum and pressure reservoir

IV.14.RBC/WBC first orifice cleaning cycle

Using the remaining counting vacuum
- V7 is activated.
- V9 is alternatively activated and disactivated.

IV.15.WBC chamber draining

WBC chamber is emptied first.
- Waste pump is activated.
- V10 is activated.
- V11 is activated.
- V12 is activated.

The waste pump is first activated for a fixed time, then, the waste detector is activated and the pump finally stops when there is no more liquid detected.
The pump membranes are used a lot by a mixing of salted water, blood and air. Think to change them regularly :
Less than 50 num/day change them 1 time/years
More than 50 num/day change them 2 times/year.

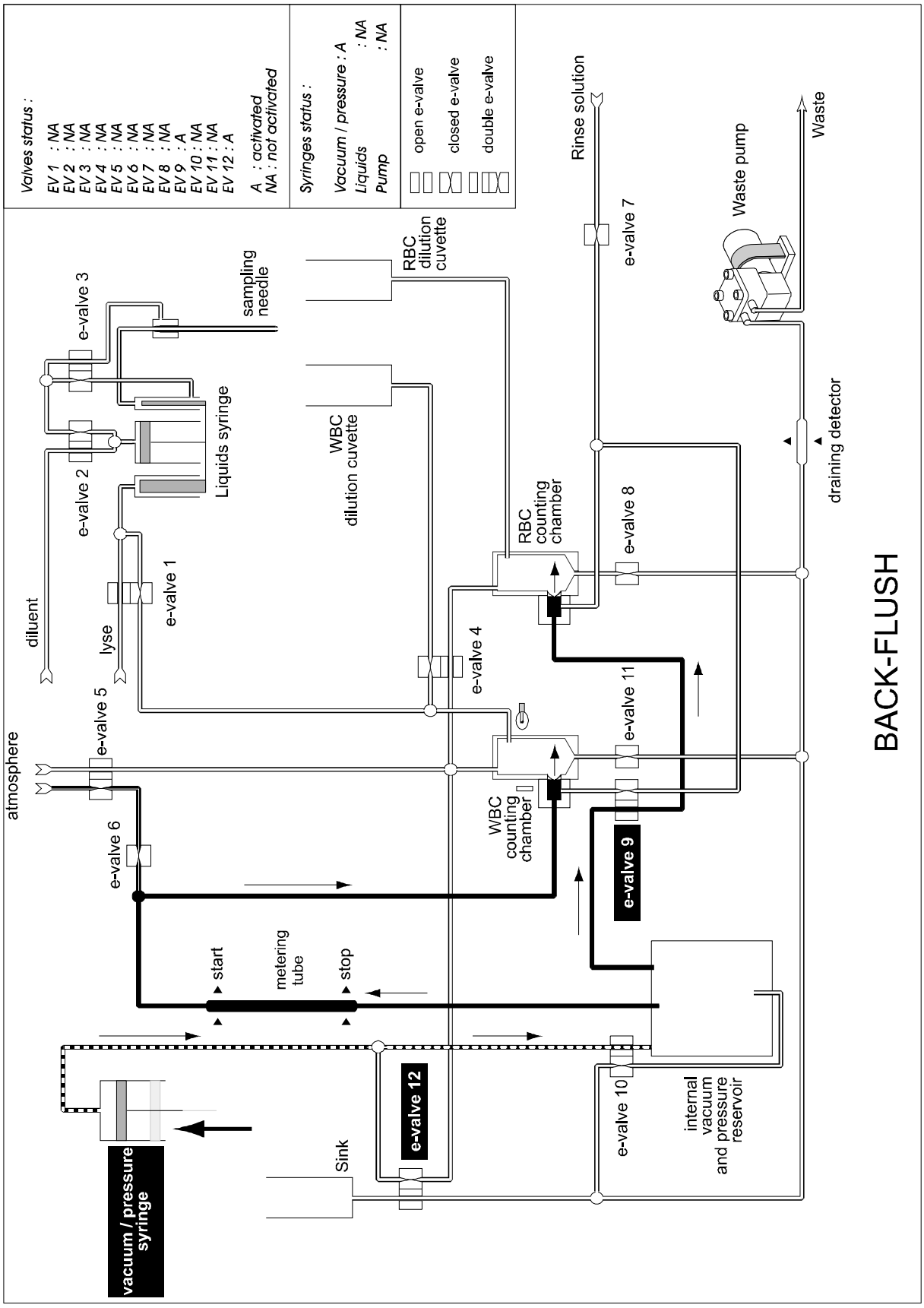
IV.16.Final WBC rinsing and backflush

Diluent in the WBC dilution cuvette is transferred to the counting chamber to rinse it.
- V5 is activated to « seal » the counting chamber.
- V10 is activated.
- The air syringe is pulled down to build vacuum in the WBC chamber.
- V4 is activated to aspirate diluent from the dilution cuvette.

Simultaneously, The back of the RBC orifice is rinsed.
- V10 is activated.
- Waste pump is activated .
- V9 is activated.
- V7 is activated.

WBC cuvette is drained.
- V5 is activated to allow air in the air syringe.
- V11 is activated.
- V4 is deactivated.
- Waste pump is activated.
- V10 is activated.

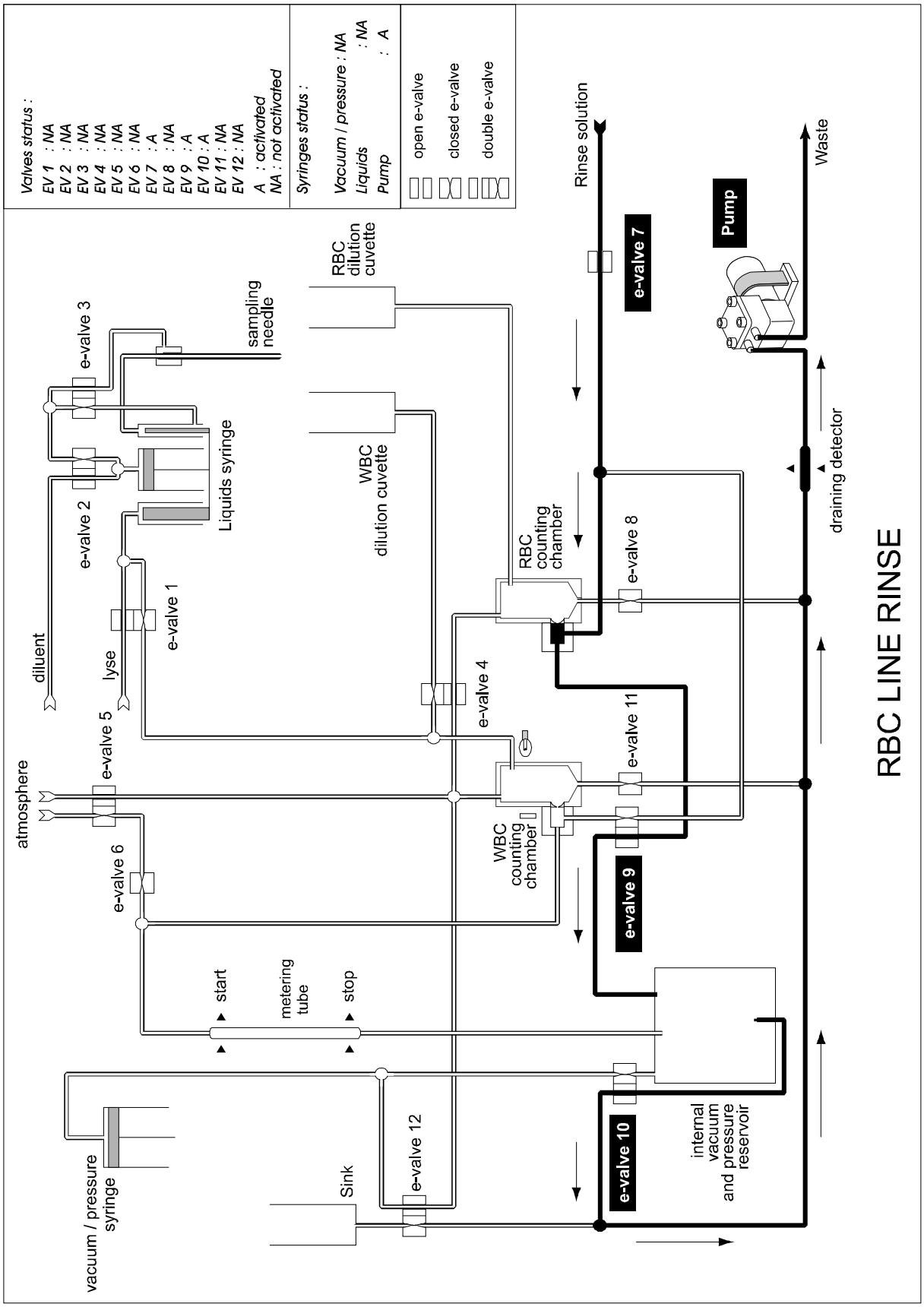
Backflush is performed on both orifices.
- V11 is deactivated.
- V12 is activated.
- V9 is activated.
- Air syringe moves up to push air at the back of the orifices.

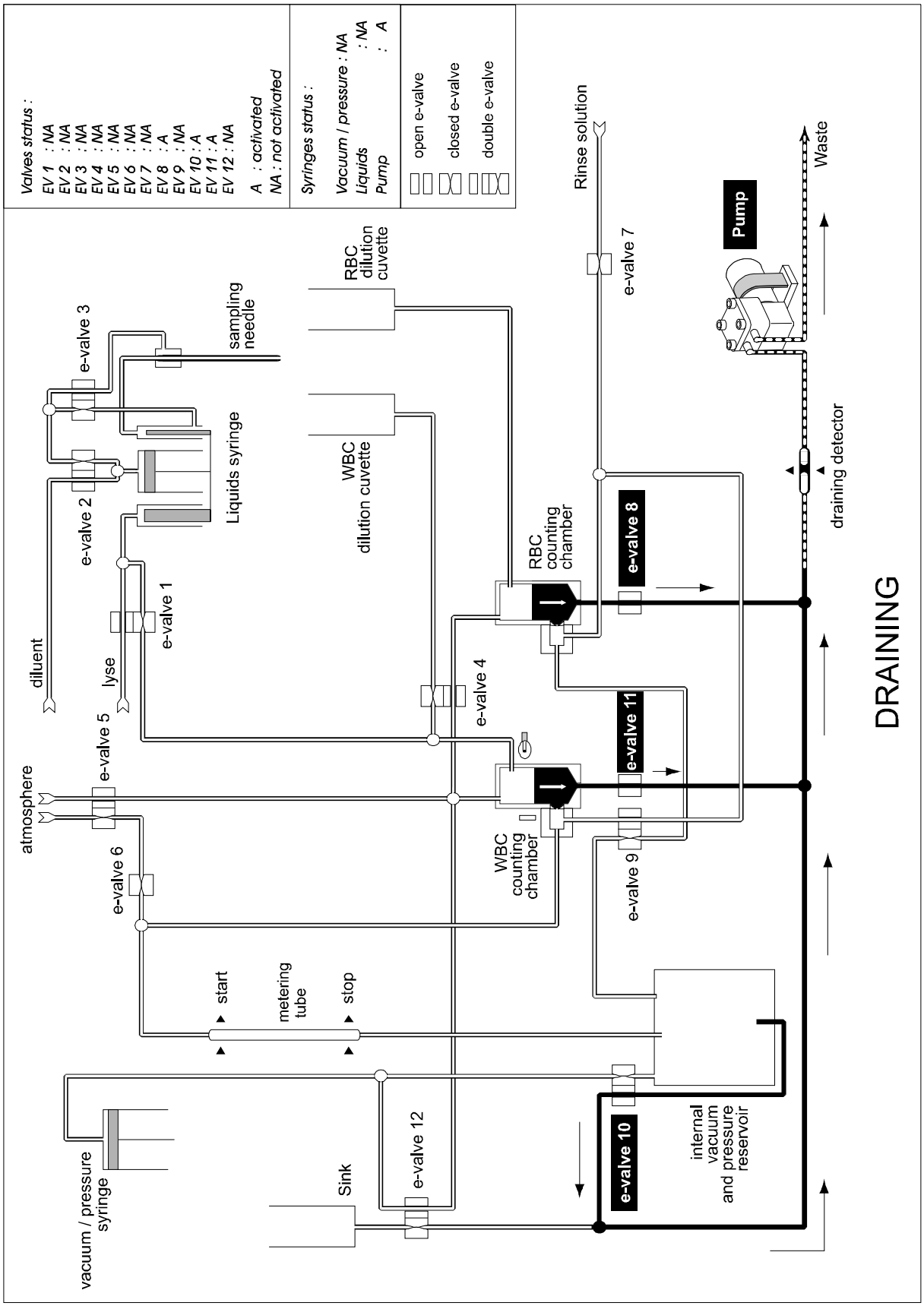

Valves status :
EV 1 : NA
EV 2 : NA
EV 3 : NA
EV 4 : NA
EV 5 : NA
EV 6 : NA
EV 7 : NA
EV 8 : NA
EV 9 : A
EV 10 : NA
EV 11 : NA
EV 12 : A
A : activated
NA : not activated
Syringes status :
Vacuum / pressure : A
Liquids : NA
Pump : NA
open e-valve
closed e-valve
double e-valve
BACK-FLUSH
Rinse solution
e-valve 7
Waste pump
Waste
RBC dilution cuvette
sampling needle
e-valve 3
Liquids syringe
WBC dilution cuvette
RBC counting chamber
e-valve 8
draining detector
diluent
e-valve 2
e-valve 1
lyse
e-valve 4
e-valve 11
e-valve 5
atmosphere
WBC counting chamber
e-valve 6
e-valve 9
start
metering tube
stop
e-valve 12
e-valve 10
internal vacuum and pressure reservoir
Sink
vacuum / pressure syringe

IV.17.RBC draining and rinsing

RBC cuvette is drained.
- V8 is activated.
- Waste pump is activated.

Diluent from the RBC dilution cuvette is transferred
- V8 is activated.
- Air syringe moves up to push air at the back of the orifices.


Valves status :
EV 1 : NA
EV 2 : NA
EV 3 : NA
EV 4 : NA
EV 5 : NA
EV 6 : NA
EV 7 : A
EV 8 : NA
EV 9 : A
EV 10 : A
EV 11 : NA
EV 12 : NA
A : activated
NA : not activated
Syringes status :
Vacuum / pressure : NA
Liquids : NA
Pump : A
open e-valve
closed e-valve
double e-valve
RBC LINE RINSE
Rinse solution
Waste
Pump
e-valve 7
draining detector
RBC dilution cuvette
sampling needle
e-valve 3
WBC dilution cuvette
Liquids syringe
e-valve 2
e-valve 1
diluent
lyse
e-valve 5
atmosphere
e-valve 6
RBC counting chamber
e-valve 8
e-valve 4
e-valve 11
WBC counting chamber
e-valve 9
start
metering tube
stop
internal vacuum and pressure reservoir
e-valve 10
e-valve 12
Sink
vacuum / pressure syringe

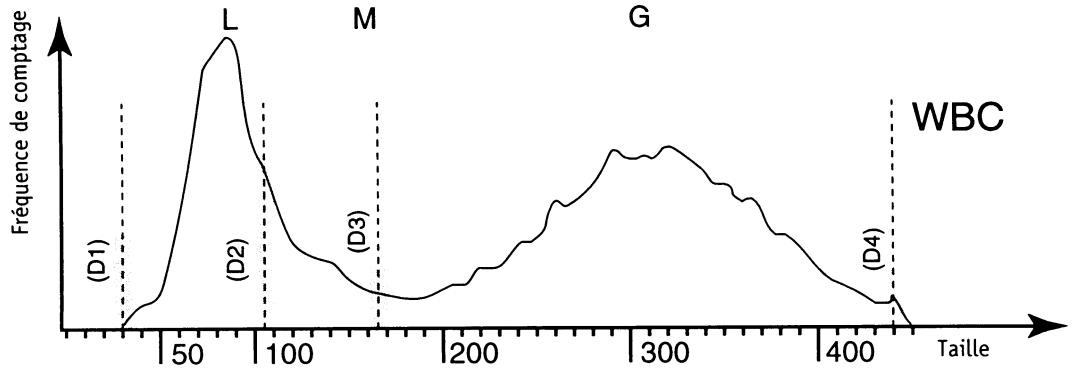

Valves status :
EV 1 : NA
EV 2 : NA
EV 3 : NA
EV 4 : NA
EV 5 : NA
EV 6 : NA
EV 7 : NA
EV 8 : A
EV 9 : NA
EV 10 : A
EV 11 : A
EV 12 : NA
A : activated
NA : not activated
Syringes status :
Vacuum / pressure : NA
Liquids : NA
Pump : A
open e-valve
closed e-valve
double e-valve
DRAINING
Rinse solution
e-valve 7
Pump
Waste
draining detector
RBC dilution cuvette
sampling needle
e-valve 3
WBC dilution cuvette
Liquids syringe
e-valve 2
RBC counting chamber
e-valve 8
diluent
lyse
e-valve 1
e-valve 4
e-valve 11
atmosphere
e-valve 5
WBC counting chamber
e-valve 6
e-valve 9
start
metering tube
stop
vacuum / pressure syringe
Sink
e-valve 12
e-valve 10
internal vacuum and pressure reservoir

V Alarms list

Mechanical and fluidic errors
Vacuum/pressure syringe motion
Liquid syringe motion
Sampling needle motion
Cuvettes bloc motion
Drain default

System alerts	
S0	Backflush during count
S1	Startup not validated
S2	Clog begins in RBC aperture
S3	Statistic rejects
S4	Half dilution suggested
S5	WBC TOF too short (-0.5 s)
S6	WBC TOF too long (+0.7 s)
S7	WBC aperture clog (TOF > 12 s)
S8	Bad HGB reference channel
S9	Half dilution done

Biological alerts	
D1	Alert region 1
D2	Alert region 2
D3	Alert region 3
D4	Alert region 4
P1	Electrical noise
P2	Big platelets or PLT aggregates
P3	RBC interference in PLT histogram
Z1	PLT interference in RBC histogram
Z2	Too high MCHC



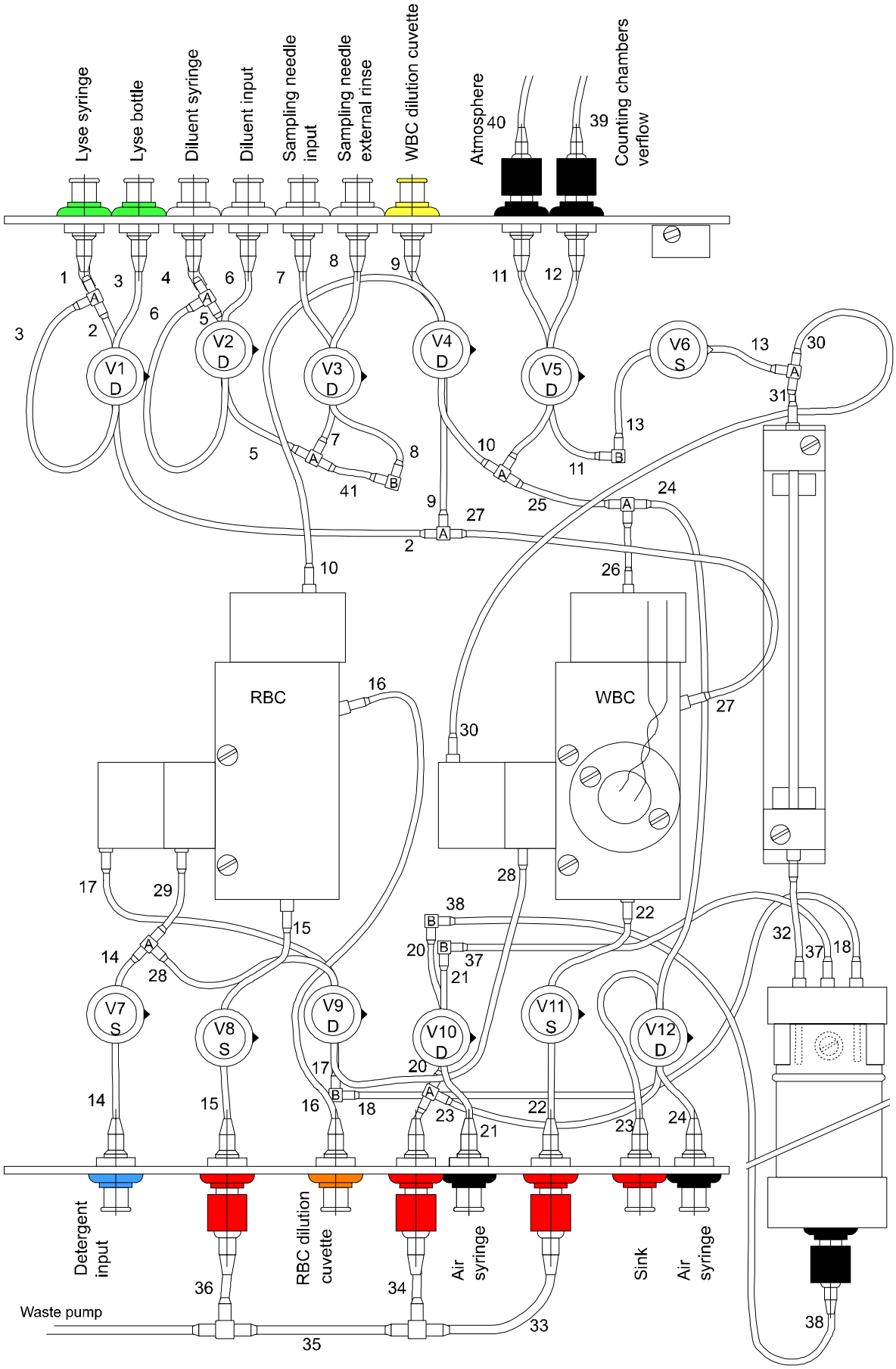
VI System description

VI.1.Fluidic assemblies

- RBC/PLT chamber
- WBC/HGB chamber
- WBC metering tube
- Sampling syringe
- Diluent syringe
- Lyse syringe
- Vacuum and pressure syringe
- Dilution cuvettes block
- Waste pump

VI.2.Electrovalves

- EV1: Lyse aspiration /dispense
- EV2: Diluent aspiration/dispense
- EV3: Sample aspiration/dispense
- EV4: RBC/WBC transfer
- EV5: Insulation of counting chambers during dilution transfers
- EV6: Bubble making (together with EV5)
- EV7: Detergent (Hemaref II) aspiration
- EV8: RBC chamber draining
- EV9: RBC orifice vacuum/pressure
- EV10: Internal vacuum reservoir draining
- EV11: WBC chamber draining
- EV12: Sink draining, RBC chamber vacuum/pressure



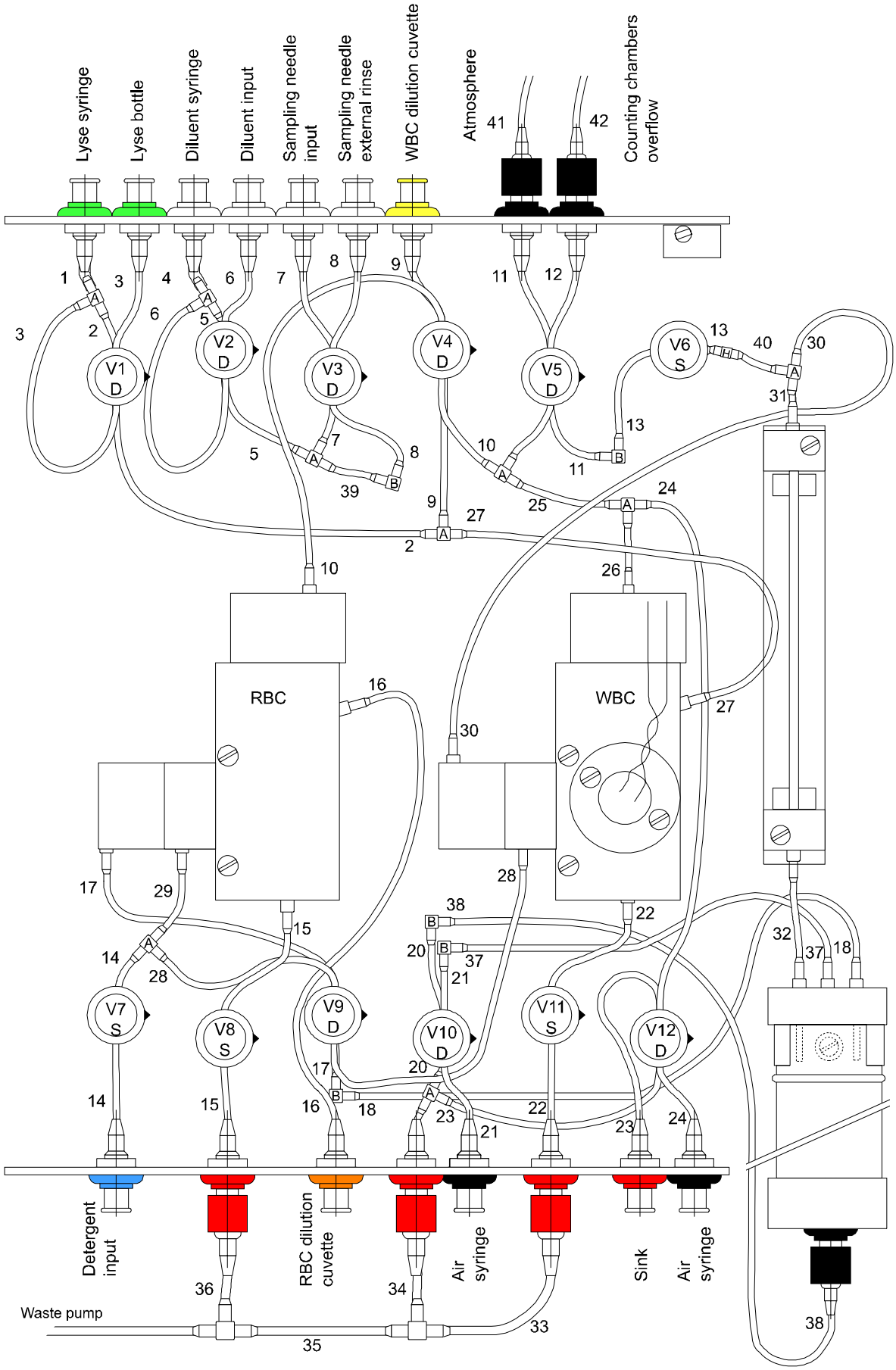
Fluidic schematic for CELLY S/N < B1018

Length ant type of tubing used for CELLY
SN < B1018

N°	Leng	Diameter	Material	Reference
1	12	1/16x1/8	Tygon	524100050
2	125	5/64x1/8	Silastic	524100560
3	120	5/64x1/8	Silastic	524100560
4	12	1/16x1/8	Tygon	524100050
5	50	5/64x1/8	Silastic	524100560
6	120	5/64x1/8	Silastic	524100560
7	70	5/64x1/8	Silastic	524100560
8	25	5/64x1/8	Silastic	524100560
9	70	5/64x1/8	Silastic	524100560
10	165	5/64x1/8	Silastic	524100560
11	70	5/64x1/8	Silastic	524100560
12	70	5/64x1/8	Silastic	524100560
13	65	1/16x1/8	Silastic	524100550
14	65	1/16x1/8	Silastic	524100550
15	85	1/16x1/8	Silastic	524100550
16	160	1/16x1/8	Tygon	524100050
17	110	5/64x1/8	Silastic	524100560
18	190	1/16x1/8	Tygon	524100050
19	12	1/16x1/8	Tygon	524100050
20	40	5/64x1/8	Silastic	524100560
21	65	5/64x1/8	Silastic	524100560
22	85	1/16x1/8	Silastic	524100550
23	160	5/64x1/8	Silastic	524100560
24	210	5/64x1/8	Silastic	524100560
25	40	1/16x1/8	Tygon	524100050
26	15	1/16x1/8	Tygon	524100050
27	140	1/16x1/8	Tygon	524100050
28	180	5/64x1/8	Silastic	524100560
29	30	1/16x1/8	Tygon	524100050
30	200	1/16x1/8	Tygon	524100050
31	12	3/32x5/32	Tygon	524100070
32	30	3/32x5/32	Tygon	524100070
33	55	1/8x1/4	Tygon	524100100
34	25	1/8x1/4	Tygon	524100100
35	45	1/8x1/4	Tygon	524100100
36	30	1/8x1/4	Tygon	524100100
37	120	1/16x1/8	Tygon	524100050
38	210	1/16x1/8	Tygon	524100050
39	450	1/8x1/4	Tygon	524100100
40	450	1/8x1/4	Tygon	524100100
41	45	1/16x1/8	Tygon	524100050

rep.	Quantity	Type	Reference
A	9	T 420-1	52240172
B	4	L 420-1	52240174
C	1	MTL 220-1	52240056
D	4	MLLR -3	52240058
E	2	MLLR -2	52240058
F	5	MTL 230-1	?
K	17	FTLLB 220-1	52240061
L	17	LNS -1	51054670
M	2	T 430-1	52240172
Bc	4	CCLR -1	52240065
N	4	CCLR -2	52240065
R	4	CCLR -3	52240065
V	2	CCLR -4	52240065
Bl	1	CCLR -5	52240065
O	1	CCLR -6	52240065
J	1	CCLR -7	52240065

Table of correspondence	
Inch	mm
1/16	1,58
1/8	3,18
1/4	6,35
1/32	0,79
3/32	2,38
5/32	3,97
5/64	1,98



Fluidic schematic for CELLY S/N ≥ B1018

Length ant type of tubing used for CELLY

SN < B1018

A few changes were made on the tubings on SN B1018 and the following instruments.
The tubing n° 13 between V6 and the metering tube is different, as it is better to have a small volume to get the proper detection bubble.

N°	Leng	Diameter	Material	Reference
1	14	1/16x1/8	Tygon	524100050
2	115	5/64x1/8	Silastic	524100560
3	120	5/64x1/8	Silastic	524100560
4	14	1/16x1/8	Tygon	524100050
5	50	5/64x1/8	Silastic	524100560
6	120	5/64x1/8	Silastic	524100560
7	70	5/64x1/8	Silastic	524100560
8	85	5/64x1/8	Silastic	524100560
9	70	5/64x1/8	Silastic	524100560
10	165	5/64x1/8	Silastic	524100560
11	70	5/64x1/8	Silastic	524100560
12	70	5/64x1/8	Silastic	524100560
13	55	1/16x1/8	Silastic	524100550
14	65	1/16x1/8	Silastic	524100550
15	85	1/16x1/8	Silastic	524100550
16	160	1/16x1/8	Tygon	524100050
17	110	5/64x1/8	Silastic	524100560
18	190	1/16x1/8	Tygon	524100050
19	14	1/16x1/8	Tygon	524100050
20	40	5/64x1/8	Silastic	524100560
21	60	5/64x1/8	Silastic	524100560
22	85	1/16x1/8	Silastic	524100550
23	160	5/64x1/8	Silastic	524100560
24	210	5/64x1/8	Silastic	524100560
25	40	1/16x1/8	Tygon	524100050
26	14	1/16x1/8	Tygon	524100050
27	140	1/16x1/8	Tygon	524100050
28	180	5/64x1/8	Silastic	524100560
29	30	1/16x1/8	Tygon	524100050
30	200	1/16x1/8	Tygon	524100050
31	12	3/32x5/32	Tygon	524100070
32	30	3/32x5/32	Tygon	524100070
33	55	1/8x1/4	Tygon	524100100
34	25	1/8x1/4	Tygon	524100100
35	45	1/8x1/4	Tygon	524100100
36	30	1/8x1/4	Tygon	524100100
37	120	1/16x1/8	Tygon	524100050
38	210	1/16x1/8	Tygon	524100050
39	14	1/16x1/8	Tygon	524100050
40	25	1/32x3/32	Tygon	521400040
41	450	1/8x1/4	Tygon	524100100
42	450	1/8x1/4	Tygon	524100100

rep.	Quantity	Type	Reference
A	9	T 420-1	52240172
A	5	L 420-1	52240174
C	1	MTL 220-1	52240056
D	4	MLLR -3	52240058
E	2	MLLR -2	52240058
F	5	MTL 230-1	?
G	1	T 420/410	52240172
H	1	N 420/410	52240180
K	17	FTLLB 220-	52240061
L	17	LNS -1	51054670
M	2	T 430-1	52240172
Bc	4	CCLR -1	52240065
N	4	CCLR -2	52240065
R	4	CCLR -3	52240065
V	2	CCLR -4	52240065
Bl	1	CCLR -5	52240065
O	1	CCLR -6	52240065
J	1	CCLR -7	52240065

Table of correspondence

Inch	mm
1/16	1,58
1/8	3,18
1/4	6,35
1/32	0,79
3/32	2,38
5/32	3,97
5/64	1,98

VI.3.Electronic compartment

VI.3.1. Electronic boards

- PC Power Supply
- 28V Power Supply Board
- Pentium Mother Board
- Video Controller
- Fluidic Controller
- CPU Controller
- Analog Controller
- Motor Driver Board
- Pre-Amplifier Board

VI.3.2. Electronic circuits

- Valves Connection Circuit
- Draining Detector Circuit
- Metering Tube Detectors circuit

VI.4.Computer compartment

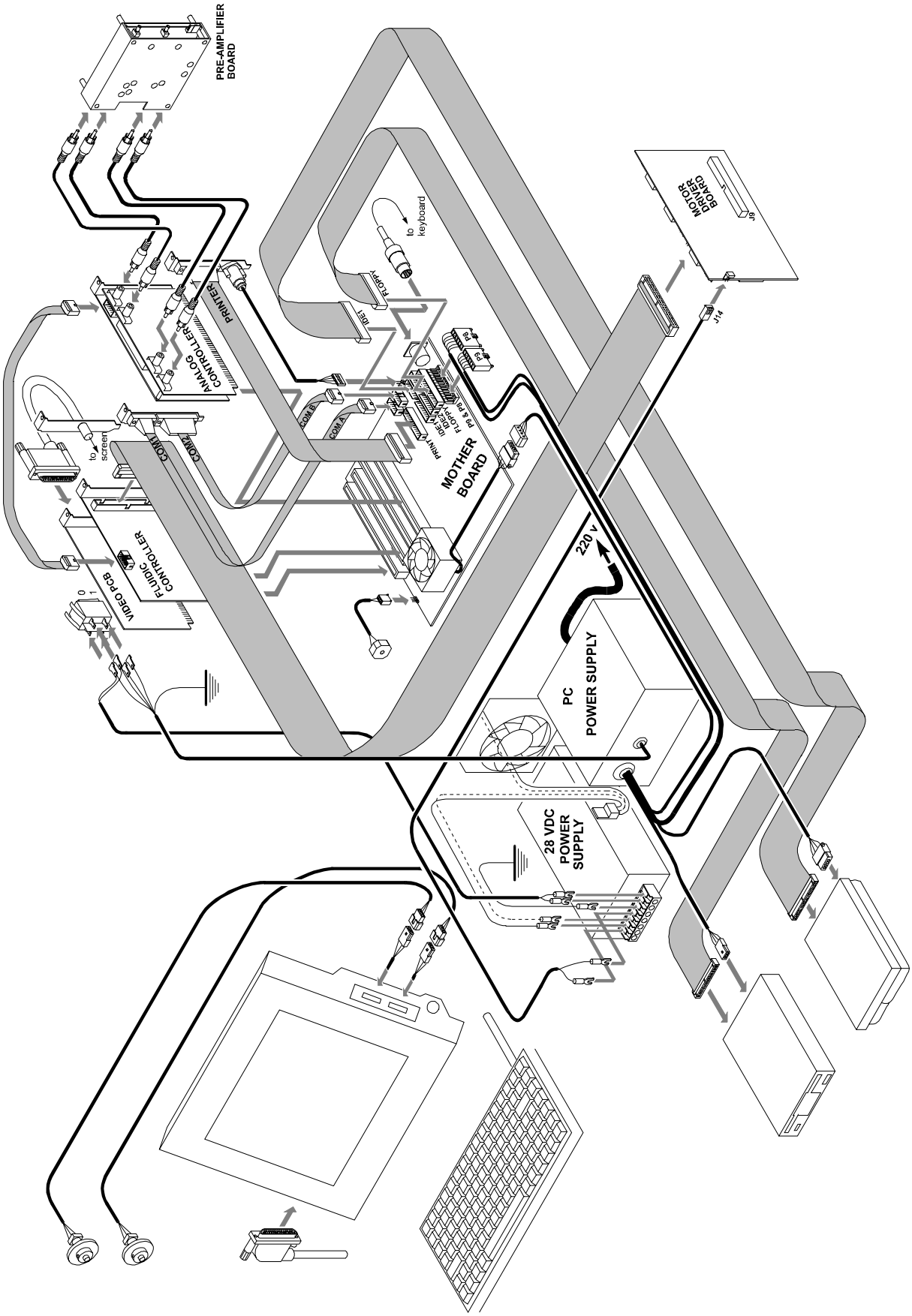
VI.4.1. Mother board

CELLY is controlled by a Pentium Mother Board.
This main board is a high performance system hardware based on Intel Pentium processor.
It is equipped with 4 master PCI slots, 4 sixteen-bit ISA slots, 2 serial ports, 1 parallel port (bi-direction), 1 floppy port.
The information found in the Setup program is stored in a battery-backed CMOS RAM.

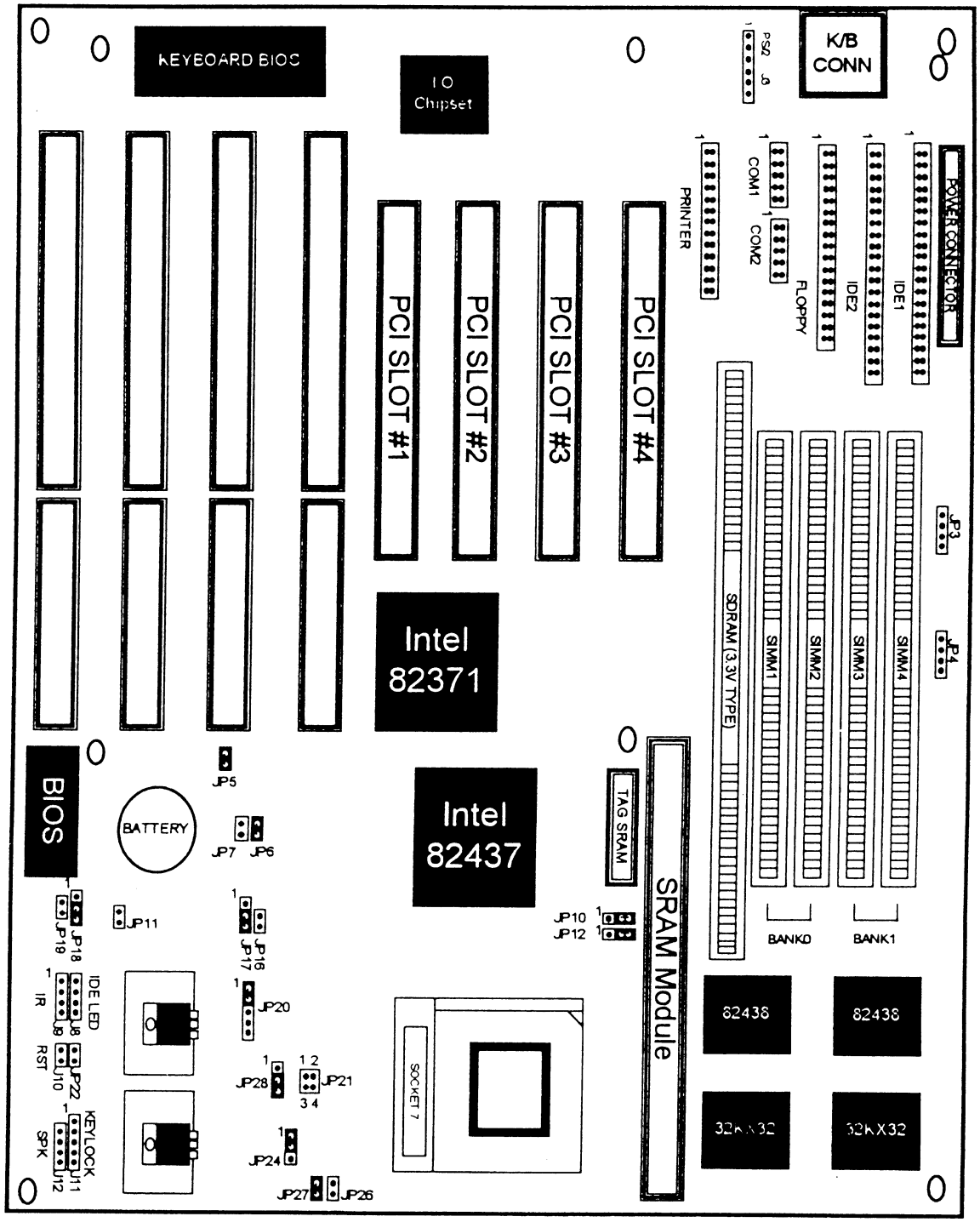
There is different version of the motherboard, always equipped with a microprocessor Pentium, compatible themselves. Moreover 2 Mo are enough for the good functioning of the CELLY.

- Serial number < B1028: Mother board PVX1, CPU Intel 133 MHz and 2 Mo RAM Reference: B901620
- Serial number ≥ B1028: Mother board PVX3, CPU Intel 133 MHz and 2 Mo RAM Reference: B901620
- Serial number ≥ B1093: Mother board PVX3, CPU Intel 133 MHz and 8 Mo RAM Reference: B901620
- Serial number ≥ B1108: Mother board PVX3, CPU Intel 166 MHz and 8 Mo RAM Reference: B901621
- Serial number ≥ B1282: Mother board PTX43, CPU Intel 166 MHz and 8 Mo RAM Reference: B901622

For each board the description of the setup program is given in the following pages.


PRE-AMPLIFIER BOARD
PRINTER
ANALOG CONTROLLER
to keyboard
FLOPPY
IDE1
MOTOR DRIVER BOARD
J14
COM B
COM A
MOTHER BOARD
to screen
COM2
COM1
FLUIDIC CONTROLLER
VIDEO PCB
220 v
PC POWER SUPPLY
28 VDC POWER SUPPLY

CELLY SN < B1028 (Pentium VX1)



JUMPERS POSITIONS:
JP20: between 1 and 2; JP21: between 1and 3 and between 2 and 4;
JP28: between 2 and 3; JP24: between 1 and 2 (P54C 3,3V);
JP6: OPEN; JP7: OPEN; JP27: SHORT
JP16: OPEN; JP26: OPEN; JP5: SHORT (CYRIX 6x86 P166=INTEL 133 MHz)
JP10: between 2 and 3; JP12: between 1 and 2; JP17: between 2 and 3
JP18: between 2 and 3; JP19: OPEN.

- *Note*: Be careful with the CPU fan.

```
                    ROM PCI/ISA BIOS (2A59GSE9)
                      STANDARD CMOS SETUP
                      AWARD SOFTWARE, INC.

   Date (mm:dd:yy) : Wed, Jun 14 2000
   Time (hh:mm:ss) :  8 : 45 : 30

   HARD DISKS          TYPE   SIZE    CYLS HEAD PRECOMP LANDZ SECTOR  MODE
   ------------------------------------------------------------------------
   Primary Master    : User   1285    2490   16   65535  2489     63  AUTO
   Primary Slave     : None      0       0    0       0     0      0 ------
   Secondary Master  : None      0       0    0       0     0      0 ------
   Secondary Slave   : None      0       0    0       0     0      0 ------

   Drive A : 1.44M, 3.5 in.
   Drive B : None                          Base Memory:   640K
   Floppy 3 Mode Support : Disabled      Extended Memory:  1024K
                                            Other Memory:   384K
   Video   : EGA/VGA                      ----------------------
   Halt On : All Errors                     Total Memory:  2048K

     : Select Item       PU/PD/+/- : Modify
   F1  : Help              (Shift)F2 : Change Color
```

```
                    ROM PCI/ISA BIOS (2A59GSE9)
                      BIOS FEATURES SETUP
                      AWARD SOFTWARE, INC.

 Virus Warning                 : Disabled   Video  BIOS Shadow  : Enabled
 CPU Internal Cache            : Disabled   C8000-CBFFF Shadow  : Disabled
 External Cache                : Disabled   CC000-CFFFF Shadow  : Disabled
 Quick Power On Self Test      : Disabled   D0000-D3FFF Shadow  : Disabled
 Boot Sequence                 : A,C        D4000-D7FFF Shadow  : Disabled
 Swap Floppy Drive             : Disabled   D8000-DBFFF Shadow  : Disabled
 Boot Up Floppy Seek           : Enabled    DC000-DFFFF Shadow  : Disabled
 Boot Up NumLock Status        : Off
 Boot Up System Speed          : High
 Gate A20 Option               : Fast
 Typematic Rate Setting        : Disabled
 Typematic Rate (Chars/Sec)    : 6
 Typematic Delay (Msec)        : 250
 Security Option               : Setup
 PCI/VGA Palette Snoop         : Disabled
: Select Item
                                F1  : Help        PU/PD/+/- : Modify
                                F5  : Old Values  (Shift)F2 : Color
                                F6  : Load BIOS  Defaults
                                F7  : Load Setup Defaults
```

```
                    ROM PCI/ISA BIOS (2A59GSE9)
                      CHIPSET FEATURES SETUP
                      AWARD SOFTWARE, INC.

 Auto Configuration            : Enabled    Delayed Transaction      : Enabled
 DRAM Timing                   : 70ns

 DRAM RAS# Precharge Time      : 4
 DRAM R/W Leadoff Timing       : 6
 Fast RAS To CAS Delay         : 3
 DRAM Read Burst (EDO/FP)      : x333/x444
 DRAM Write Burst Timing       : x333
 Fast MA to RAS# Delay CLK     : 1
 Fast EDO Path Select          : Disabled
 Refresh RAS# Assertion        : 5 Clks
 ISA Bus Clock                 : PCICLK/4

 System BIOS Cacheable         : Disabled
 Video  BIOS Cacheable         : Disabled
: Select Item
 16 Bit I/O Recovery Time      : 1          F1  : Help        PU/PD/+/- : Modify
 Memory Hole At 15M-16M        : Disabled   F5  : Old Values  (Shift)F2 : Color
 Peer Concurrency              : Enabled    F6  : Load BIOS  Defaults
 Passive Release               : Enabled    F7  : Load Setup Defaults
```

ROM PCI/ISA BIOS (2A59GSE9)
POWER MANAGEMENT SETUP
AWARD SOFTWARE, INC.

```
Power Management      : Disable          ** Power Down & Resume Events **
PM Control by APM     : Yes              IRQ3  (COM 2)          : ON
Video Off Method      : V/H SYNC+Blank   IRQ4  (COM 1)          : ON
MODEM Use IRQ         : 3                IRQ5  (LPT 2)          : OFF
                                         IRQ6  (Floppy Disk)    : OFF
Doze Mode             : Disable          IRQ7  (LPT 1)          : OFF
Standby Mode          : Disable          IRQ8  (RTC Alarm)      : OFF
Suspend Mode          : Disable          IRQ9  (IRQ2 Redir)     : OFF
HDD Power Down        : Disable          IRQ10 (Reserved)       : OFF
                                         IRQ11 (Reserved)       : OFF
** Wake Up Events In Doze & Standby **   IRQ12 (PS/2 Mouse)     : OFF
IRQ3  (Wake-Up Event): ON                IRQ13 (Coprocessor)    : OFF
IRQ4  (Wake-Up Event): ON                IRQ14 (Hard Disk)      : ON
IRQ8  (Wake-Up Event): ON                IRQ15 (Reserved)       : OFF
IRQ12 (Wake-Up Event): ON
: Select Item ||
                                         F1  : Help        PU/PD/+/- : Modify
                                         F5  : Old Values  (Shift)F2 : Color
                                         F6  : Load BIOS  Defaults
                                         F7  : Load Setup Defaults
```

ROM PCI/ISA BIOS (2A59GSE9)
PNP/PCI CONFIGURATION
AWARD SOFTWARE, INC.

```
Resources Controlled By  : Manual       PCI IRQ Actived By  : Level
Reset Configuration Data : Disabled     PCI IDE IRQ Map To  : PCI-AUTO
                                         Primary   IDE INT# : A
IRQ-3  assigned to : Legacy ISA          Secondary IDE INT# : B
IRQ-4  assigned to : Legacy ISA
IRQ-5  assigned to : PCI/ISA PnP        Used MEM base addr  : N/A
IRQ-7  assigned to : PCI/ISA PnP
IRQ-9  assigned to : PCI/ISA PnP
IRQ-10 assigned to : PCI/ISA PnP
IRQ-11 assigned to : PCI/ISA PnP
IRQ-12 assigned to : PCI/ISA PnP
IRQ-14 assigned to : PCI/ISA PnP
IRQ-15 assigned to : PCI/ISA PnP
DMA-0  assigned to : PCI/ISA PnP
DMA-1  assigned to : PCI/ISA PnP
: Select Item ||
DMA-5  assigned to : PCI/ISA PnP        F1  : Help        PU/PD/+/- : Modify
DMA-6  assigned to : PCI/ISA PnP        F5  : Old Values  (Shift)F2 : Color
DMA-7  assigned to : PCI/ISA PnP        F6  : Load BIOS  Defaults
                                        F7  : Load Setup Defaults
```

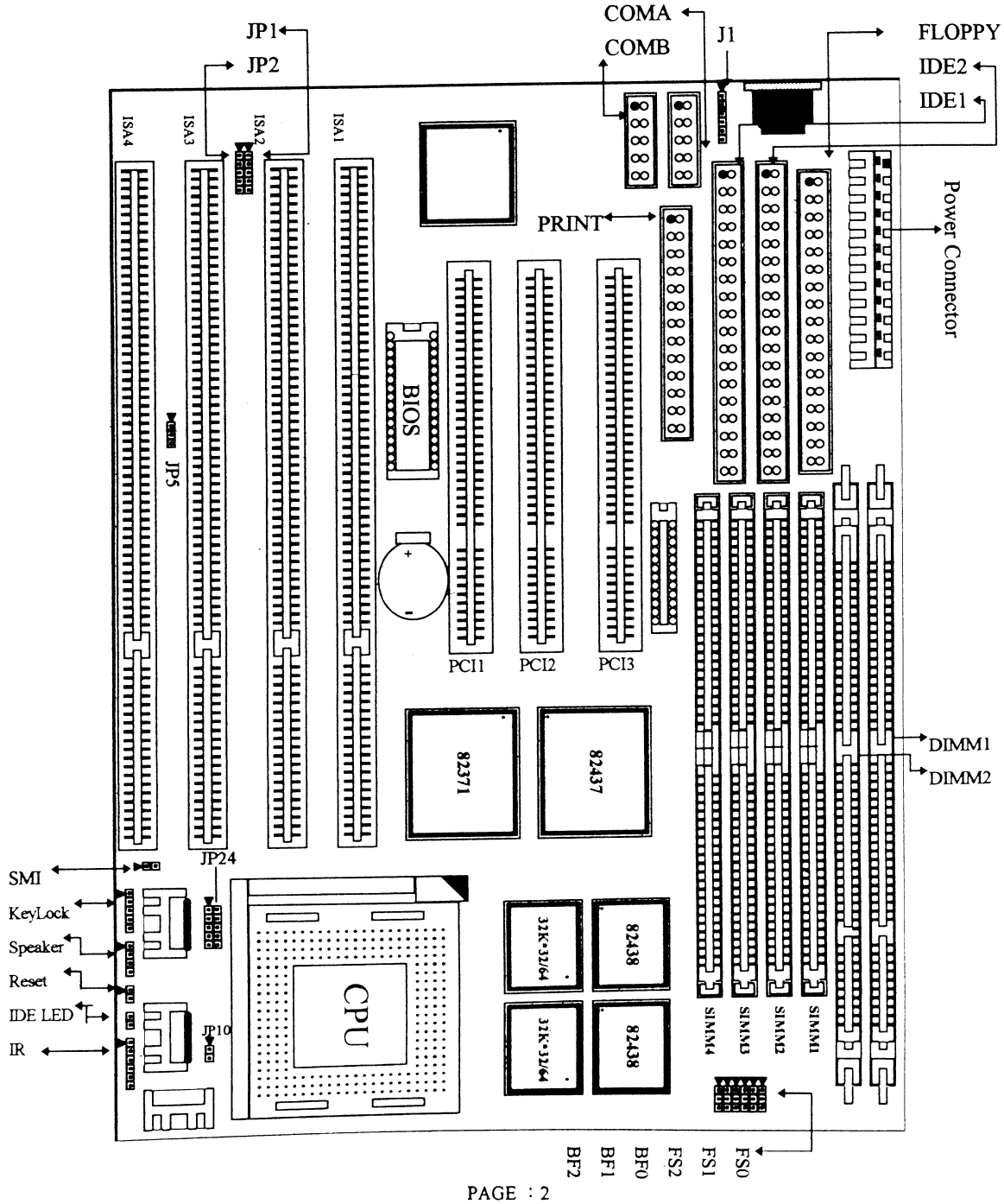
ROM PCI/ISA BIOS (2A59GSE9)
INTEGRATED PERIPHERALS
AWARD SOFTWARE, INC.

```
IDE HDD Block Mode        : Enabled
IDE Primary Master PIO    : Auto
IDE Primary Slave  PIO    : Auto
IDE Secondary Master PIO  : Auto
IDE Secondary Slave  PIO  : Auto
On-Chip Primary   PCI IDE: Enabled
On-Chip Secondary PCI IDE: Enabled
PCI Slot IDE 2nd Channel  : Enabled
USB Controller            : Disabled

Onboard FDC Controller    : Enabled
Onboard UART 1            : Auto
UART 1 operation mode     : Standard

Onboard UART 2            : Auto
: Select Item ||
                                        F1  : Help        PU/PD/+/- : Modify
Onboard Parallel Port     : 378/IRQ7    F5  : Old Values  (Shift)F2 : Color
Parallel Port Mode        : Normal      F6  : Load BIOS  Defaults
                                        F7  : Load Setup Defaults
```

CELLY B1028 <Serial number < D1282
(Pentium VX3)



PAGE : 2

JUMPERS POSITIONS:

JP1, JP2: OPEN / JP4: Between 1 and 2 (factory set) / JP5: between 2 and 3 /
JP6: between 2 and 3 (factory set) / JP8: between 1 and 2 (factory set) / JP10: OPEN
JP24: VID0=SHORT, VID1=OPEN, VID2=OPEN, VID3=SHORT, VID4=OPEN.
FS0: between 2 and 3 / FS1: between 1 and 2 / FS2: between 2 and 3 / BF0: between 2 and 3 /
BF1: between 2 and 3 / BF2: between 1 and 2.

ROM PCI/ISA BIOS (2A59ISEA)
STANDARD CMOS SETUP
AWARD SOFTWARE, INC.

```
Date (mm:dd:yy) : Tue, Jun 13 2000
Time (hh:mm:ss) : 12 : 11 : 14

HARD DISKS          TYPE    SIZE   CYLS HEAD PRECOMP LANDZ SECTOR  MODE
Primary Master    : Auto       0      0    0       0     0      0  AUTO
Primary Slave     : None       0      0    0       0     0      0 ------
Secondary Master  : None       0      0    0       0     0      0 ------
Secondary Slave   : None       0      0    0       0     0      0 ------

Drive A : 1.44M, 3.5 in.
Drive B : None

Video   : EGA/VGA
Halt On : All Errors

                    Base Memory:    640K
                Extended Memory:   7168K
                   Other Memory:    384K
                Total Memory:      8192K

   : Select Item       PU/PD/+/- : Modify
F1  : Help               (Shift)F2 : Change Color
```

ROM PCI/ISA BIOS (2A59ISEA)
BIOS FEATURES SETUP
AWARD SOFTWARE, INC.

```
Virus Warning                 : Disabled
CPU Internal Cache            : Disabled
External Cache                : Disabled
Quick Power On Self Test      : Disabled
Boot Sequence                 : A,C,SCSI
Swap Floppy Drive             : Disabled
Boot Up Floppy Seek           : Enabled
Boot Up NumLock Status        : Off
Boot Up System Speed          : High
Gate A20 Option               : Fast
Typematic Rate Setting        : Disabled
Typematic Rate (Chars/Sec)    : 6
Typematic Delay (Msec)        : 250
Security Option               : Setup
PCI/VGA Palette Snoop         : Disabled
: Select Item

Video  BIOS Shadow  : Enabled
C8000-CBFFF Shadow  : Disabled
CC000-CFFFF Shadow  : Disabled
D0000-D3FFF Shadow  : Disabled
D4000-D7FFF Shadow  : Disabled
D8000-DBFFF Shadow  : Disabled
DC000-DFFFF Shadow  : Disabled

F1  : Help        PU/PD/+/- : Modify
F5  : Old Values  (Shift)F2 : Color
F6  : Load BIOS  Defaults
F7  : Load Setup Defaults
```

ROM PCI/ISA BIOS (2A59ISEA)
CHIPSET FEATURES SETUP
AWARD SOFTWARE, INC.

```
Auto Configuration          : Enabled
DRAM Timing                 : 60ns

DRAM Leadoff Timing         : 10/6/3
DRAM Read Burst (EDO/FP)    : x222/x333
DRAM Write Burst Timing     : x222
Fast EDO Lead Off           : Enabled
Refresh RAS# Assertion      : 4 Clks
Fast RAS To CAS Delay       : 3
DRAM Page Idle Timer        : 2 Clks
DRAM Enhanced Paging        : Enabled
Fast MA to RAS# Delay       : 2 Clks
SDRAM(CAS Lat/RAS-to-CAS)   : 3/3
SDRAM Speculative Read      : Disabled
System BIOS Cacheable       : Disabled
: Select Item
8 Bit I/O Recovery Time     : 1
16 Bit I/O Recovery Time    : 1
Memory Hole At 15M-16M      : Disabled
PCI 2.1 Compliance          : Disabled

F1  : Help        PU/PD/+/- : Modify
F5  : Old Values  (Shift)F2 : Color
F6  : Load BIOS  Defaults
F7  : Load Setup Defaults
```

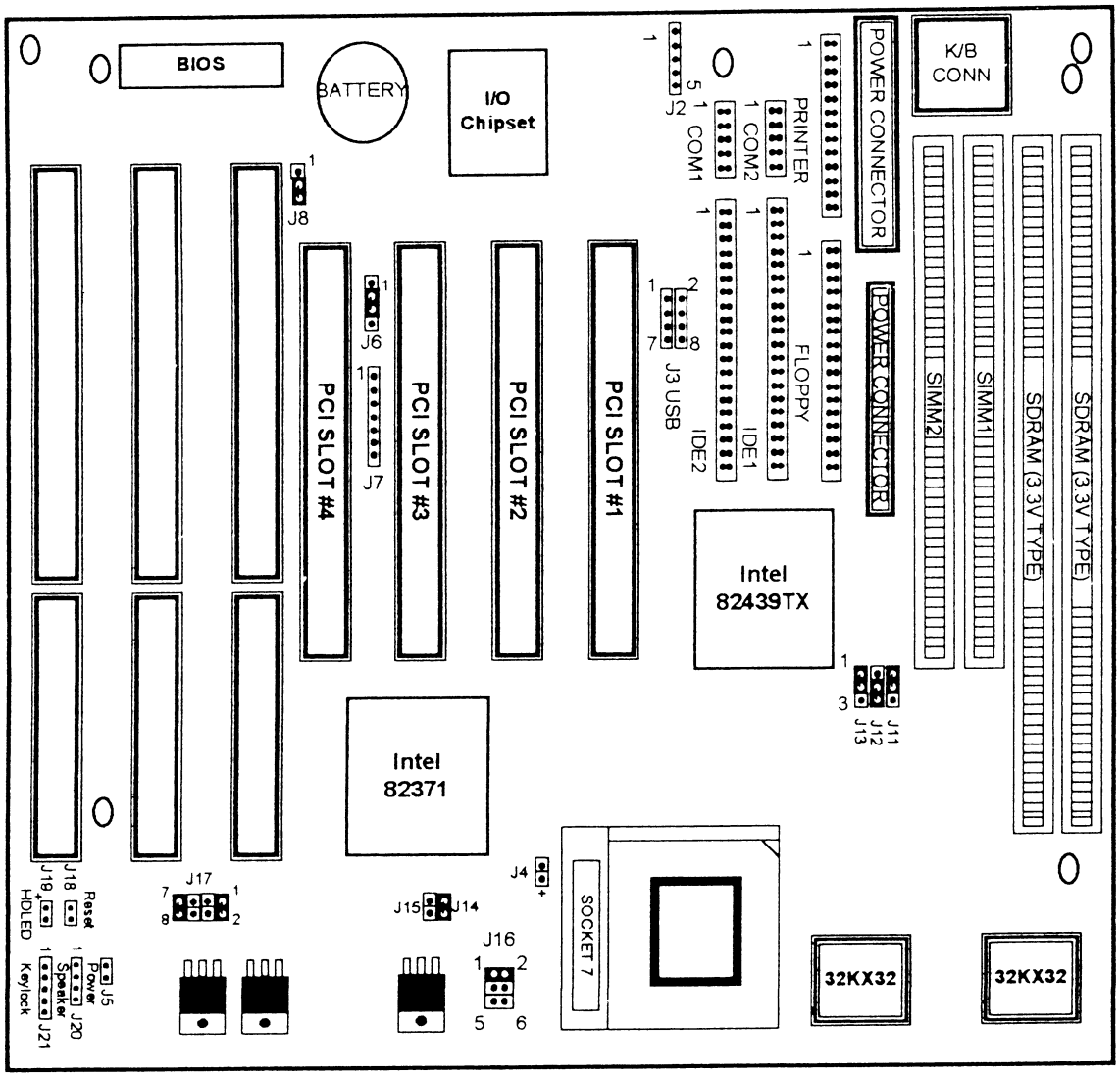
ROM PCI/ISA BIOS (2A59ISEA)
POWER MANAGEMENT SETUP
AWARD SOFTWARE, INC.

Power Management : Disabled	** Reload Global Timer Events **
PM Control by APM : Yes	IRQ[3-7,9-15],NMI : Enabled
Video Off Method : V/H SYNC+Blank	Primary IDE 0 : Enabled
Video Off After : Standby	Primary IDE 1 : Disabled
MODEM Use IRQ : 3	Secondary IDE 0 : Disabled
Doze Mode : Disabled	Secondary IDE 1 : Disabled
Standby Mode : Disabled	Floppy Disk : Enabled
Suspend Mode : Disabled	Serial Port : Enabled
HDD Power Down : Disabled	Parallel Port : Enabled
Throttle Duty Cycle : 62.5%	
ZZ Active in Suspend : Disabled	
VGA Active Monitor : Enabled	
Soft-Off by PWR-BTTN : Delay 4 Sec.	
Resume by Ring : Enabled	
IRQ 8 Break Suspend : Disabled	
: Select Item ‖	F1 : Help PU/PD/+/- : Modify
	F5 : Old Values (Shift)F2 : Color
	F6 : Load BIOS Defaults
	F7 : Load Setup Defaults

ROM PCI/ISA BIOS (2A59ISEA)
PNP/PCI CONFIGURATION
AWARD SOFTWARE, INC.

PNP OS Installed : No	PCI IDE IRQ Map To : PCI-AUTO
Resources Controlled By : Manual	Primary IDE INT# : A
Reset Configuration Data : Disabled	Secondary IDE INT# : B
	Used MEM base addr : N/A
IRQ-3 assigned to : Legacy ISA	
IRQ-4 assigned to : Legacy ISA	
IRQ-5 assigned to : PCI/ISA PnP	
IRQ-7 assigned to : PCI/ISA PnP	
IRQ-9 assigned to : PCI/ISA PnP	
IRQ-10 assigned to : PCI/ISA PnP	
IRQ-11 assigned to : PCI/ISA PnP	
IRQ-12 assigned to : PCI/ISA PnP	
IRQ-14 assigned to : PCI/ISA PnP	
IRQ-15 assigned to : PCI/ISA PnP	
DMA-0 assigned to : PCI/ISA PnP	
: Select Item ‖	
DMA-3 assigned to : PCI/ISA PnP	F1 : Help PU/PD/+/- : Modify
DMA-5 assigned to : PCI/ISA PnP	F5 : Old Values (Shift)F2 : Color
DMA-6 assigned to : PCI/ISA PnP	F6 : Load BIOS Defaults
DMA-7 assigned to : PCI/ISA PnP	F7 : Load Setup Defaults

CELLY serial number > D1282 (Pentium TX4)



JUMPERS POSITIONS:

J4: OPEN; J8: between 2 and 3; J6: between 2 and 3; J11: between 2 and 3
J12: between 1 and 2; J13: between 2 and 3; J14: OPEN; J15: SHORT
J16: between 1 and 2 and between 3 and 4
J17: between 1 and 2, between 3 and 4; between 5 and 6 and between 7 and 8.

ROM PCI/ISA BIOS (2A59ISEA)
STANDARD CMOS SETUP
AWARD SOFTWARE, INC.

```
Date (mm:dd:yy) : Tue, Jun 13 2000
Time (hh:mm:ss) : 15 : 13 : 33

HARD DISKS          TYPE    SIZE   CYLS HEAD PRECOMP LANDZ SECTOR  MODE
Primary Master    : Auto       0      0    0       0     0      0  AUTO
Primary Slave     : None       0      0    0       0     0      0  ------
Secondary Master  : None       0      0    0       0     0      0  ------
Secondary Slave   : None       0      0    0       0     0      0  ------

Drive A : 1.44M, 3.5 in.
Drive B : None

Video   : EGA/VGA
Halt On : All,But Keyboard

                    Base Memory:    640K
                Extended Memory:   7168K
                   Other Memory:    384K
                                   ------
                    Total Memory:  8192K

   : Select Item       PU/PD/+/- : Modify
F1  : Help               (Shift)F2 : Change Color
```

ROM PCI/ISA BIOS (2A59ISEA)
BIOS FEATURES SETUP
AWARD SOFTWARE, INC.

```
Virus Warning                 : Disabled
CPU Internal Cache            : Disabled
External Cache                : Disabled
Quick Power On Self Test      : Disabled
Boot Sequence                 : A,C,SCSI
Swap Floppy Drive             : Disabled
Boot Up Floppy Seek           : Enabled
Boot Up NumLock Status        : Off
Boot Up System Speed          : High
Gate A20 Option               : Fast
Typematic Rate Setting        : Disabled
Typematic Rate (Chars/Sec)    : 6
Typematic Delay (Msec)        : 250
Security Option               : Setup
PCI/VGA Palette Snoop         : Disabled

Video  BIOS Shadow  : Enabled
C8000-CBFFF Shadow  : Disabled
CC000-CFFFF Shadow  : Disabled
D0000-D3FFF Shadow  : Disabled
D4000-D7FFF Shadow  : Disabled
D8000-DBFFF Shadow  : Disabled
DC000-DFFFF Shadow  : Disabled

: Select Item

F1  : Help        PU/PD/+/- : Modify
F5  : Old Values  (Shift)F2 : Color
F6  : Load BIOS  Defaults
F7  : Load Setup Defaults
```

ROM PCI/ISA BIOS (2A59ISEA)
CHIPSET FEATURES SETUP
AWARD SOFTWARE, INC.

```
Auto Configuration          : Enabled
DRAM Timing                 : 60ns

DRAM Leadoff Timing         : 10/6/3
DRAM Read Burst (EDO/FP)    : x222/x333
DRAM Write Burst Timing     : x222
Fast EDO Lead Off           : Enabled
Refresh RAS# Assertion      : 4 Clks
Fast RAS To CAS Delay       : 3
DRAM Page Idle Timer        : 2 Clks
DRAM Enhanced Paging        : Enabled
Fast MA to RAS# Delay       : 2 Clks
SDRAM(CAS Lat/RAS-to-CAS)   : 3/3
SDRAM Speculative Read      : Disabled
System BIOS Cacheable       : Disabled

: Select Item
8 Bit I/O Recovery Time     : 1
16 Bit I/O Recovery Time    : 1
Memory Hole At 15M-16M      : Disabled
PCI 2.1 Compliance          : Disabled

F1  : Help        PU/PD/+/- : Modify
F5  : Old Values  (Shift)F2 : Color
F6  : Load BIOS  Defaults
F7  : Load Setup Defaults
```

ROM PCI/ISA BIOS (2A59ISEA)
POWER MANAGEMENT SETUP
AWARD SOFTWARE, INC.

Power Management : Disabled	** Reload Global Timer Events **
PM Control by APM : Yes	IRQ[3-7,9-15],NMI : Enabled
Video Off Method : V/H SYNC+Blank	Primary IDE 0 : Enabled
Video Off After : Standby	Primary IDE 1 : Disabled
MODEM Use IRQ : 3	Secondary IDE 0 : Disabled
Doze Mode : Disabled	Secondary IDE 1 : Disabled
Standby Mode : Disabled	Floppy Disk : Enabled
Suspend Mode : Disabled	Serial Port : Enabled
HDD Power Down : Disabled	Parallel Port : Enabled
Throttle Duty Cycle : 62.5%	
ZZ Active in Suspend : Disabled	
VGA Active Monitor : Enabled	
Soft-Off by PWR-BTTN : Delay 4 Sec.	
Resume by Ring : Enabled	
IRQ 8 Break Suspend : Disabled	
: Select Item ‖	F1 : Help PU/PD/+/- : Modify
	F5 : Old Values (Shift)F2 : Color
	F6 : Load BIOS Defaults
	F7 : Load Setup Defaults

ROM PCI/ISA BIOS (2A59ISEA)
PNP/PCI CONFIGURATION
AWARD SOFTWARE, INC.

PNP OS Installed : No	PCI IDE IRQ Map To : PCI-AUTO
Resources Controlled By : Manual	Primary IDE INT# : A
Reset Configuration Data : Disabled	Secondary IDE INT# : B
IRQ-3 assigned to : Legacy ISA	Used MEM base addr : N/A
IRQ-4 assigned to : Legacy ISA	
IRQ-5 assigned to : PCI/ISA PnP	
IRQ-7 assigned to : PCI/ISA PnP	
IRQ-9 assigned to : PCI/ISA PnP	
IRQ-10 assigned to : PCI/ISA PnP	
IRQ-11 assigned to : PCI/ISA PnP	
IRQ-12 assigned to : PCI/ISA PnP	
IRQ-14 assigned to : PCI/ISA PnP	
IRQ-15 assigned to : PCI/ISA PnP	
DMA-0 assigned to : PCI/ISA PnP	
: Select Item ‖	
DMA-3 assigned to : PCI/ISA PnP	F1 : Help PU/PD/+/- : Modify
DMA-5 assigned to : PCI/ISA PnP	F5 : Old Values (Shift)F2 : Color
DMA-6 assigned to : PCI/ISA PnP	F6 : Load BIOS Defaults
DMA-7 assigned to : PCI/ISA PnP	F7 : Load Setup Defaults

VI.4.2. Video board and screen

All information from the CELLY is visualized on a slim VGA color monitor.
This screen may be orientated for a better reading comfort.

For technical maintenance purposes, it can also be withdrawn from the computer compartment and set aside from the CELLY.

CAUTION: The Slimage monitor must not be exposed to impact or shock as it is made of fragile glass panel.
The display area must never be touched or rubbed on with sharp or stiff objects as the glass panel may be scratched.
Never use solvents to clean it. Never let liquid penetrate the monitor. Clean with a damp smooth cloth.
Don't expose it at a frozen temperature, because the liquid crystals turn into ice and the screen will not be use.

VI.5.Power supply compartment

There are two independent Power Supply assemblies in the CELLY.

VI.5.1. PC power supply

The PC Power Supply Assay is 230W.
It delivers:

- -12 VDC / 0.5 A.
- +12 VDC / 9A.
- -5 VDC / 23A.
- +5 VDC / 0.3A.

The 12 VDC Waste Pump is supplied by the PC Power Assay (serial number < D1277).

VI.5.2. 28 V and 100 W power supply (serial number < D1277)

This board provides + 28 VDC to power the valves and the electro-magnet.
It also provides 28 VDC to the Motor Interface Board, which is used through a 24 VDC, 2A regulator to provide 24 VDC to the stepping motors.
It also supplies the rear fan with 12 VDC obtained through a regulator fixed on one side of the Power Supply Board metallic case.

NOTE: There are no adjustment on the two Power Supply Boards(PC and 28 V).
The Power Supplies do not have any directly accessible fuse. In the event of failure, they are on no account to be manipulated.

VI.5.3. 24V and 150 W power supply (serial number ≥ D1277)

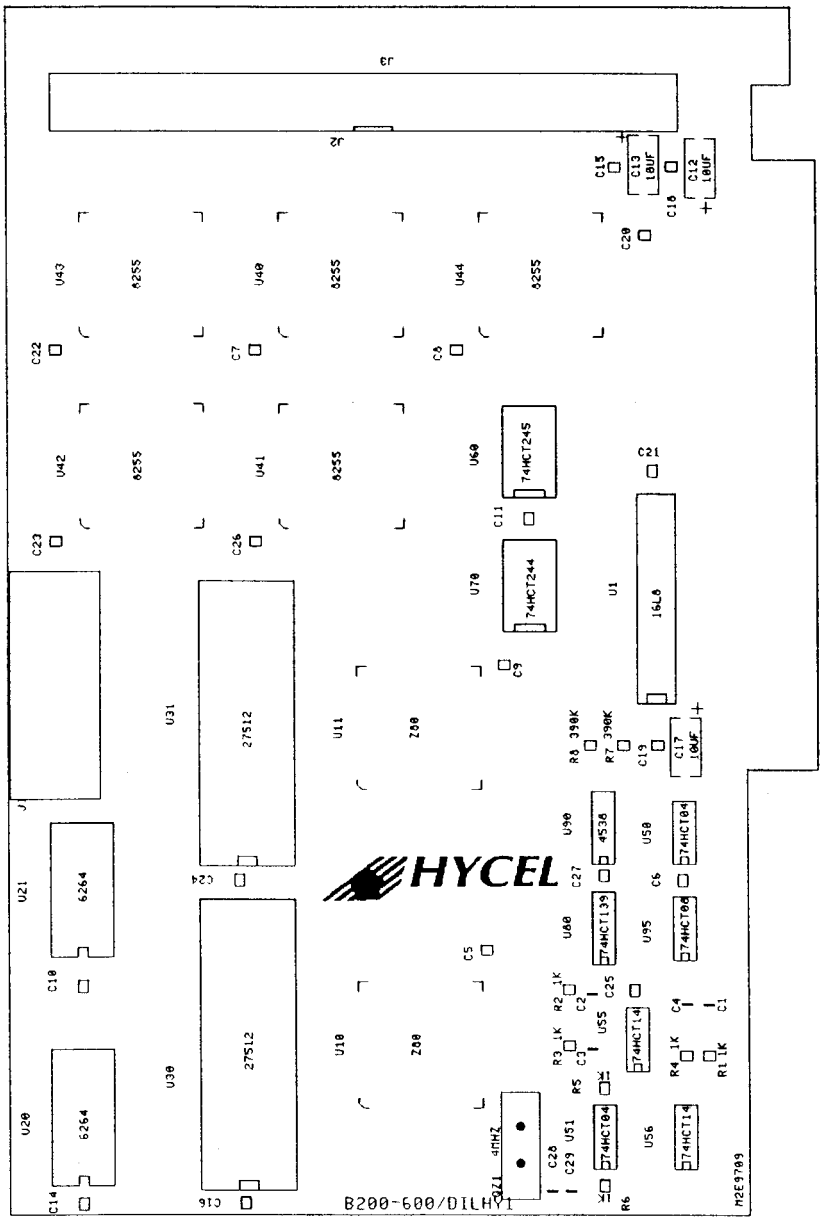
This board provides + 24 VDC to power the valves and the electro-magnet.
It also supplies the rear fan with 12 VDC obtained through a regulator fixed on one side of the Power Supply Board metallic case.
The 24 VDC Waste Pump is supplied by this power supply (serial number ≥ D1277).

Connect the + of a voltmeter on test point JP2 on the motor driver board and adjust the voltage at 24,3-24,4 with the potentiometer located on the power supply just under the red led.
During the counting cycle the voltage lower a little.

VI.6.Analog boards description

VI.6.1. Fluidic controller

The Fluidic Controller integrates two microprocessors, one for the dilutor, V1,V2 and V3 and one for the other valves and the air syringe.
The Dil microprocessor communicates with the Flui microprocessor and with the PC.
The Flui microprocessor can't communicate directly with the PC but only through the Dil microprocessor.



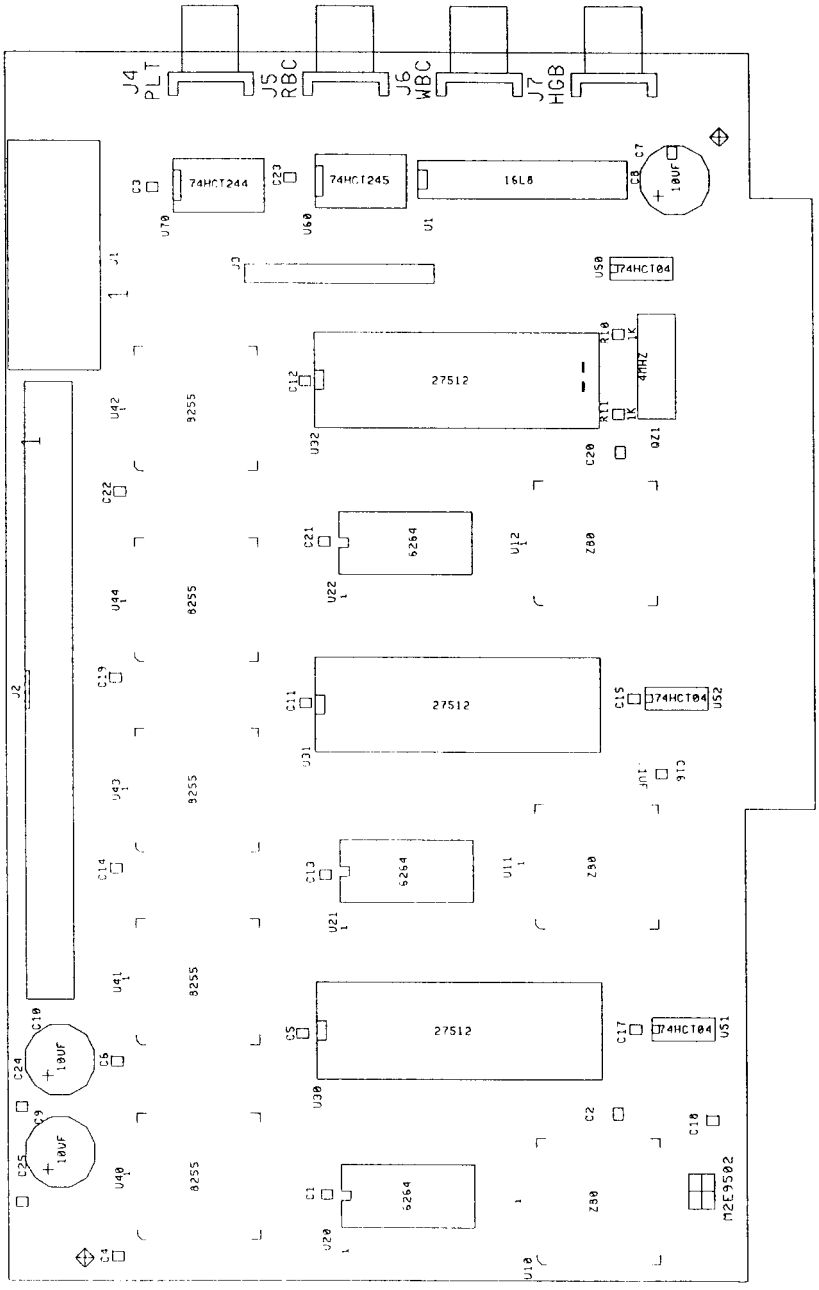
VI.6.2. CPU controller

This board integrates 3 microprocessors: one for WBC and HGB, one for RBC and one for PLT.

Each microprocessor communicates with the PC and controls:

- The beginning of the count
- The probe voltage
- The counted values sent to the PC

On the WBC and HGB microprocessor, when the WBC probe voltage is disabled, the HGB measurement is validated.

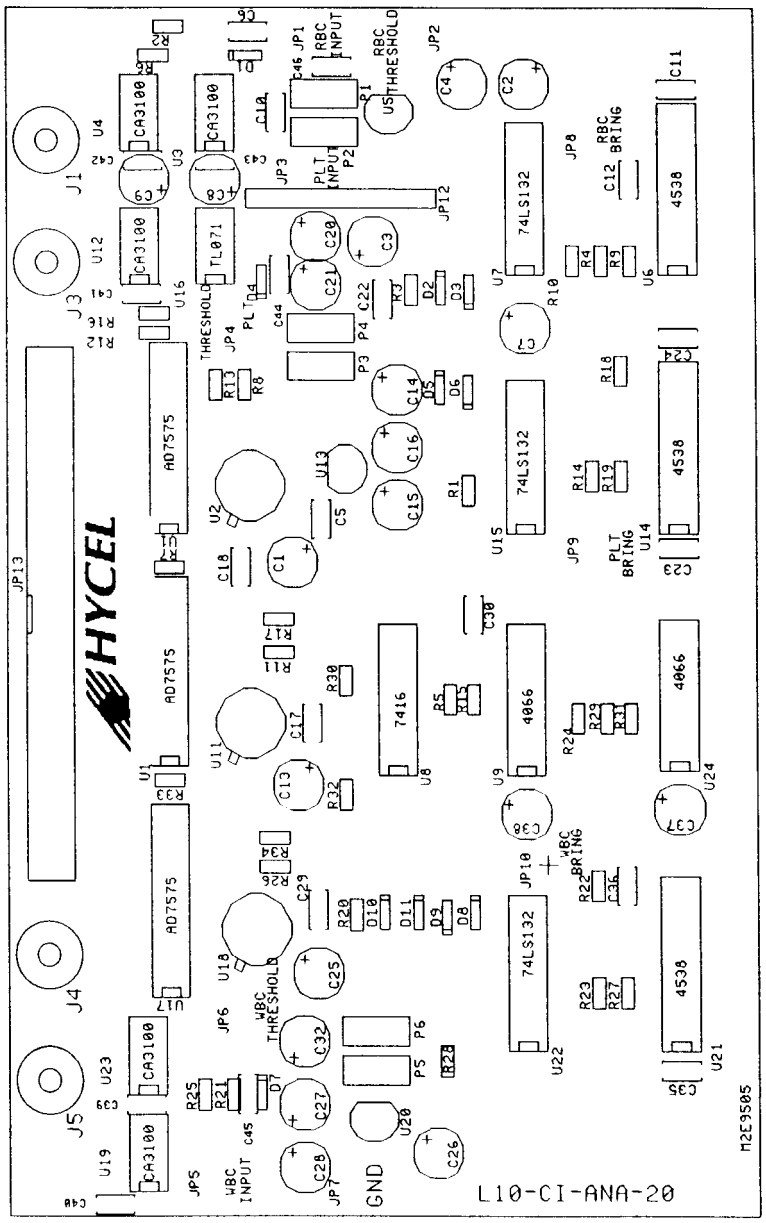


VI.6.3. Analog controller

The Analog Controller makes the analog signals coming from the Pre-Amplifier board understandable by a microprocessor.
Each analog signal is analyzed according to its size and determines the size of a cell.

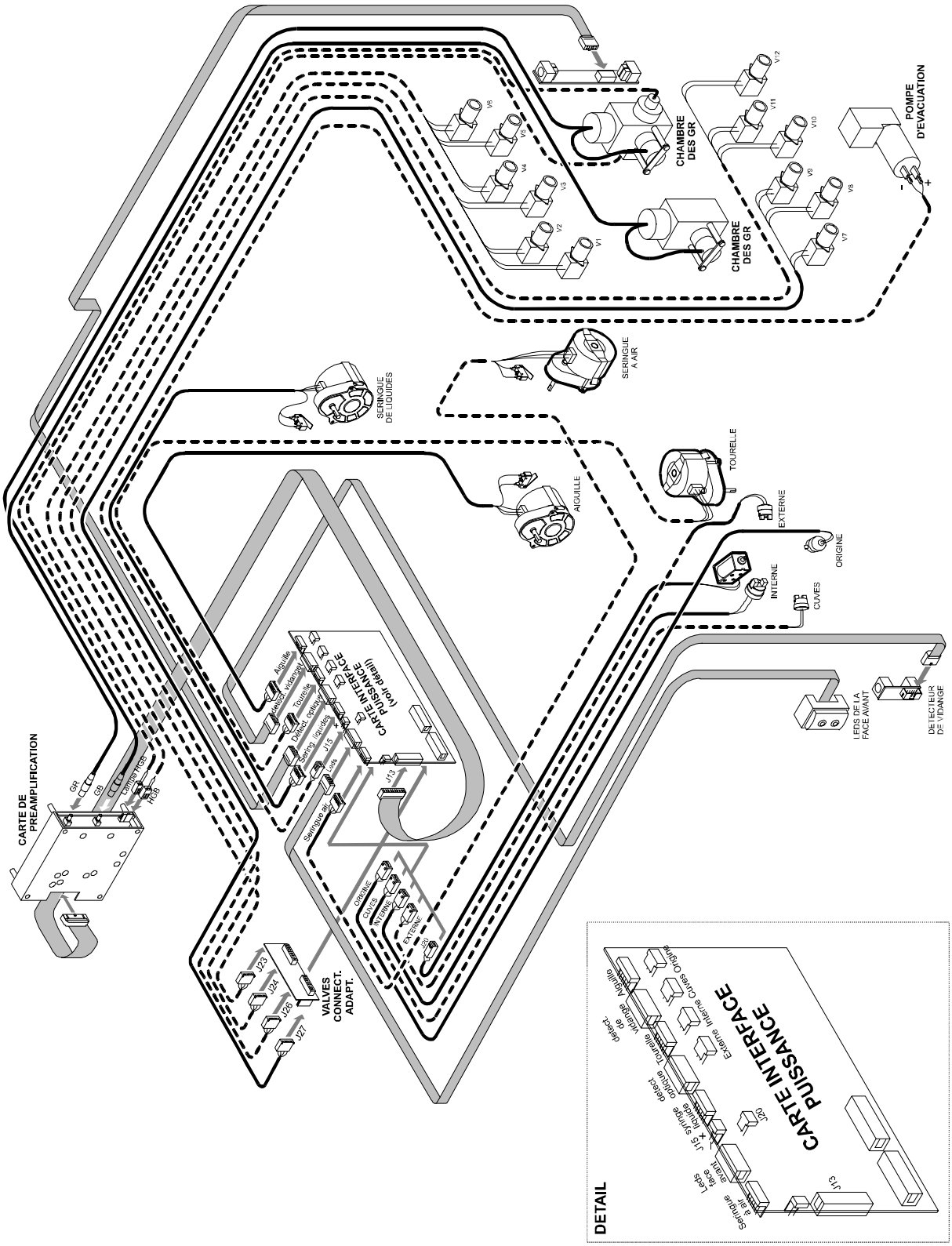
There are three converters:

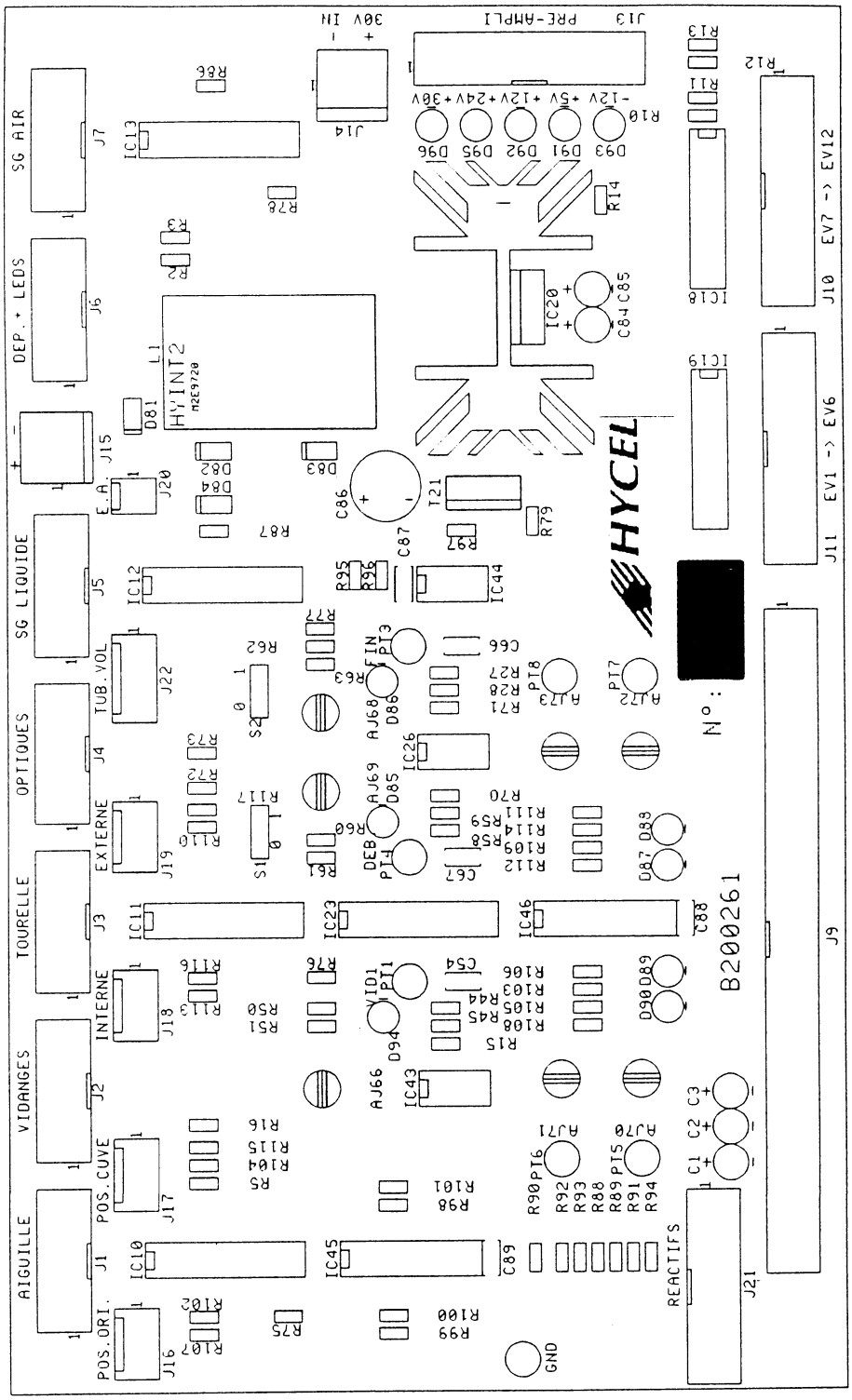
- One for WBC and HGB (a switch is selected by a microprocessor).
- One for RBC
- One for PLT



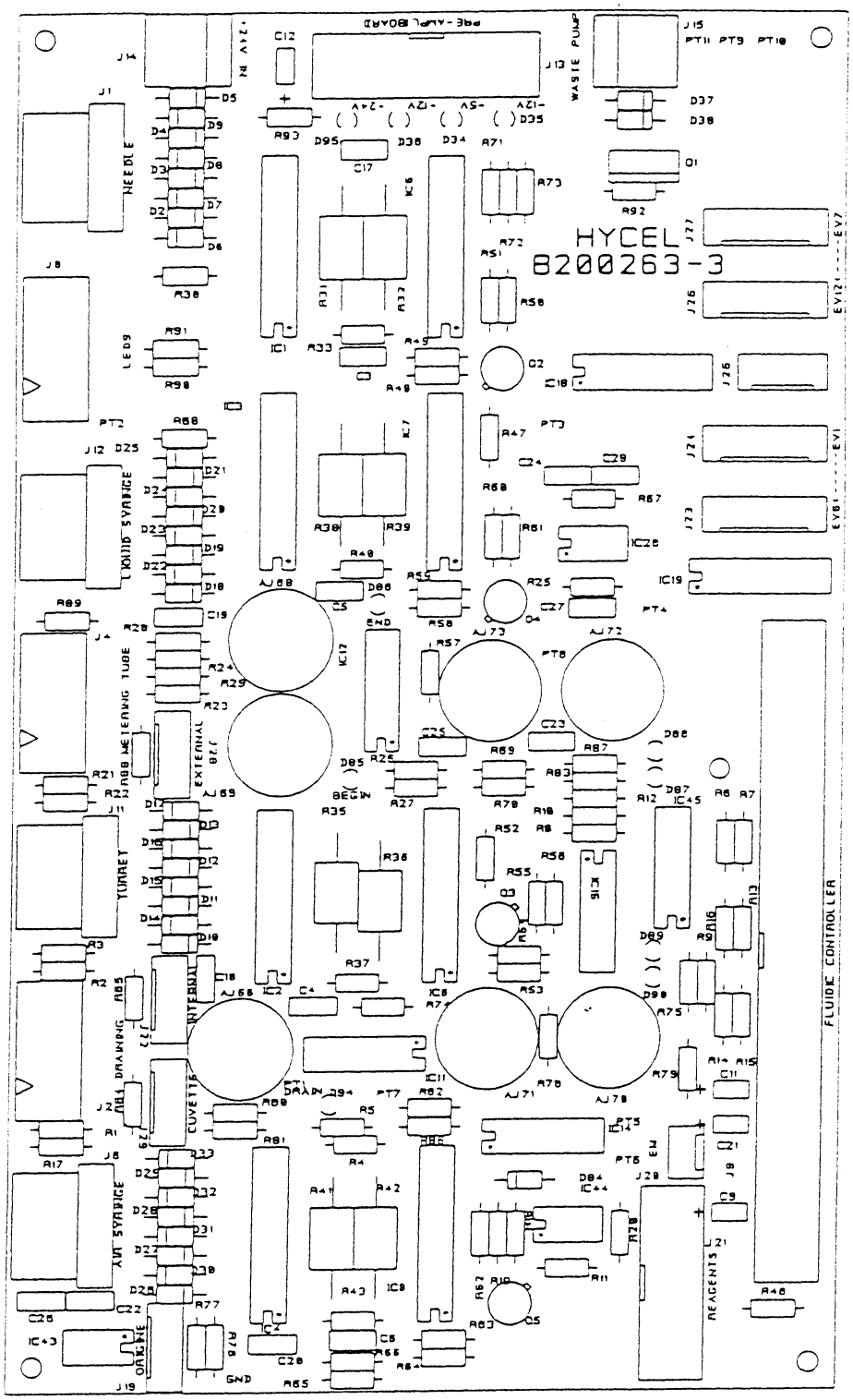
VI.6.4. Motor driver board

This board interfaces all the motors, valves and sensors.





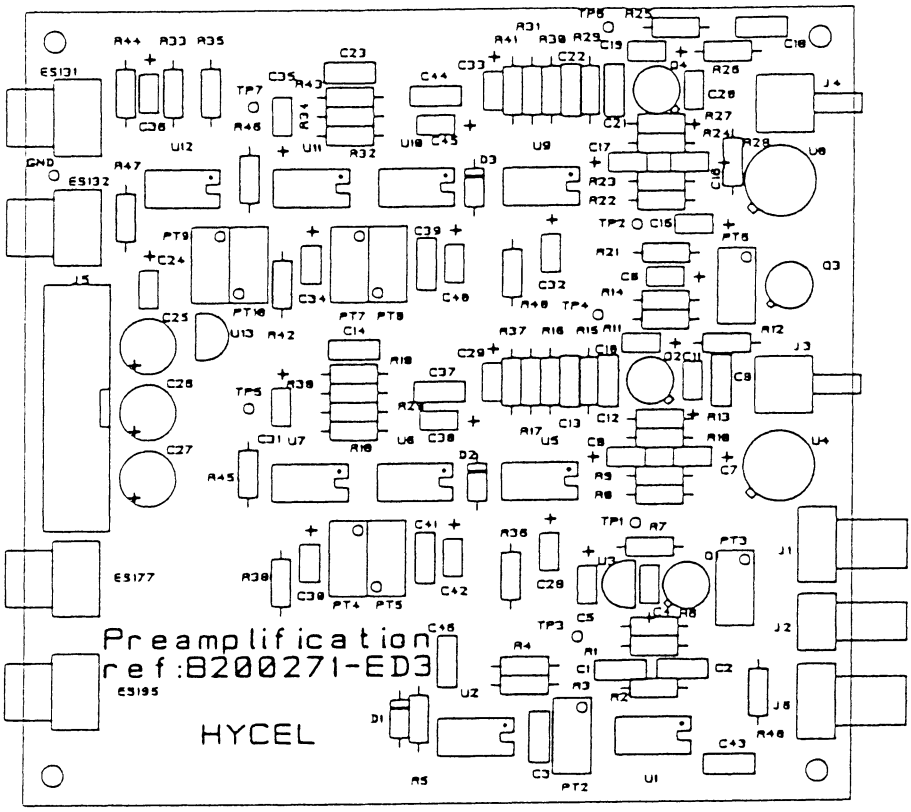
Motor driver board serial number < D1277



Motor driver boards serial number ≥ D1277

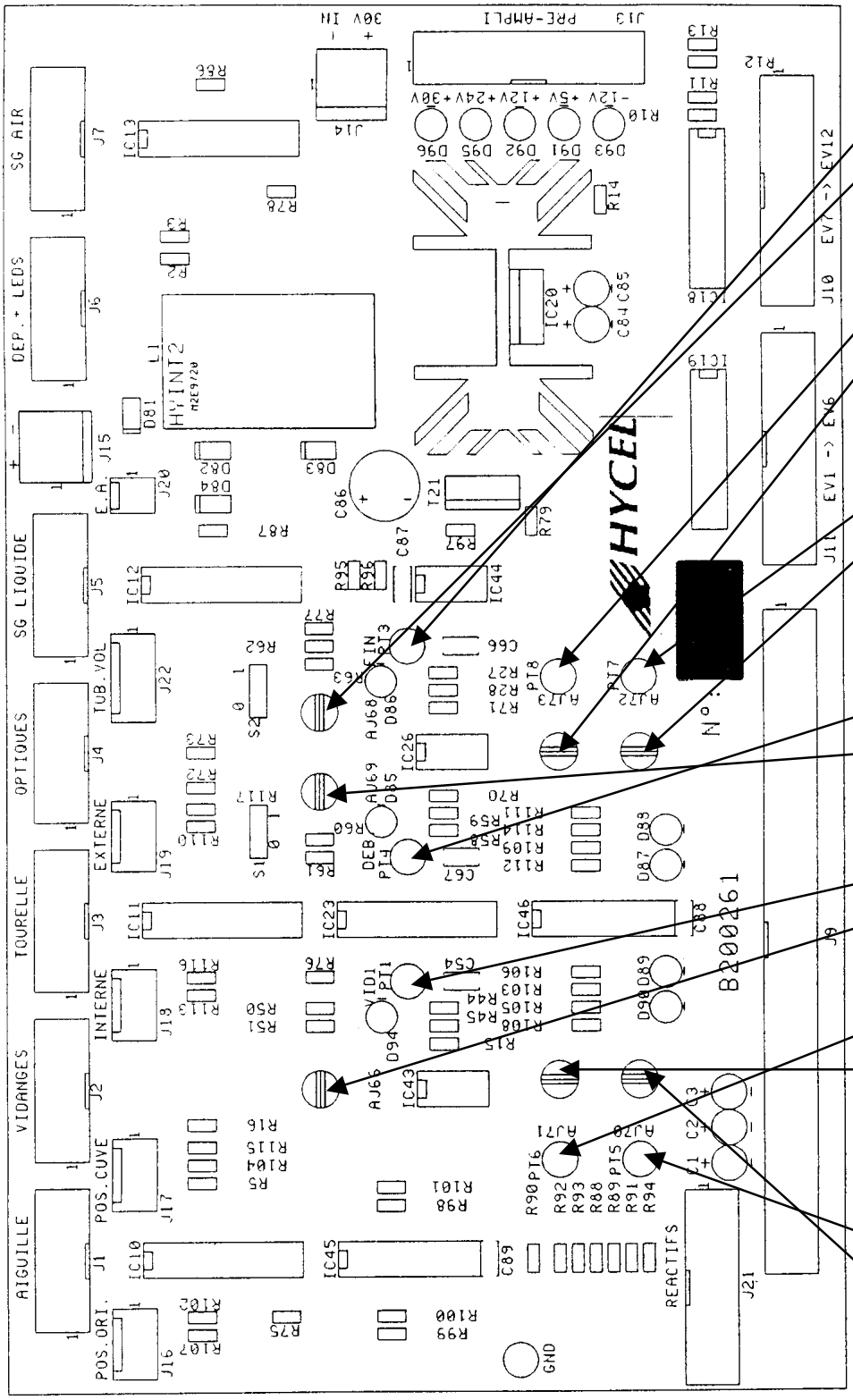
VI.6.5. Pre-amplifier board

This board polarizes the counting probes and amplifies the pulses from the orifices. The hemoglobin element is also on this board.

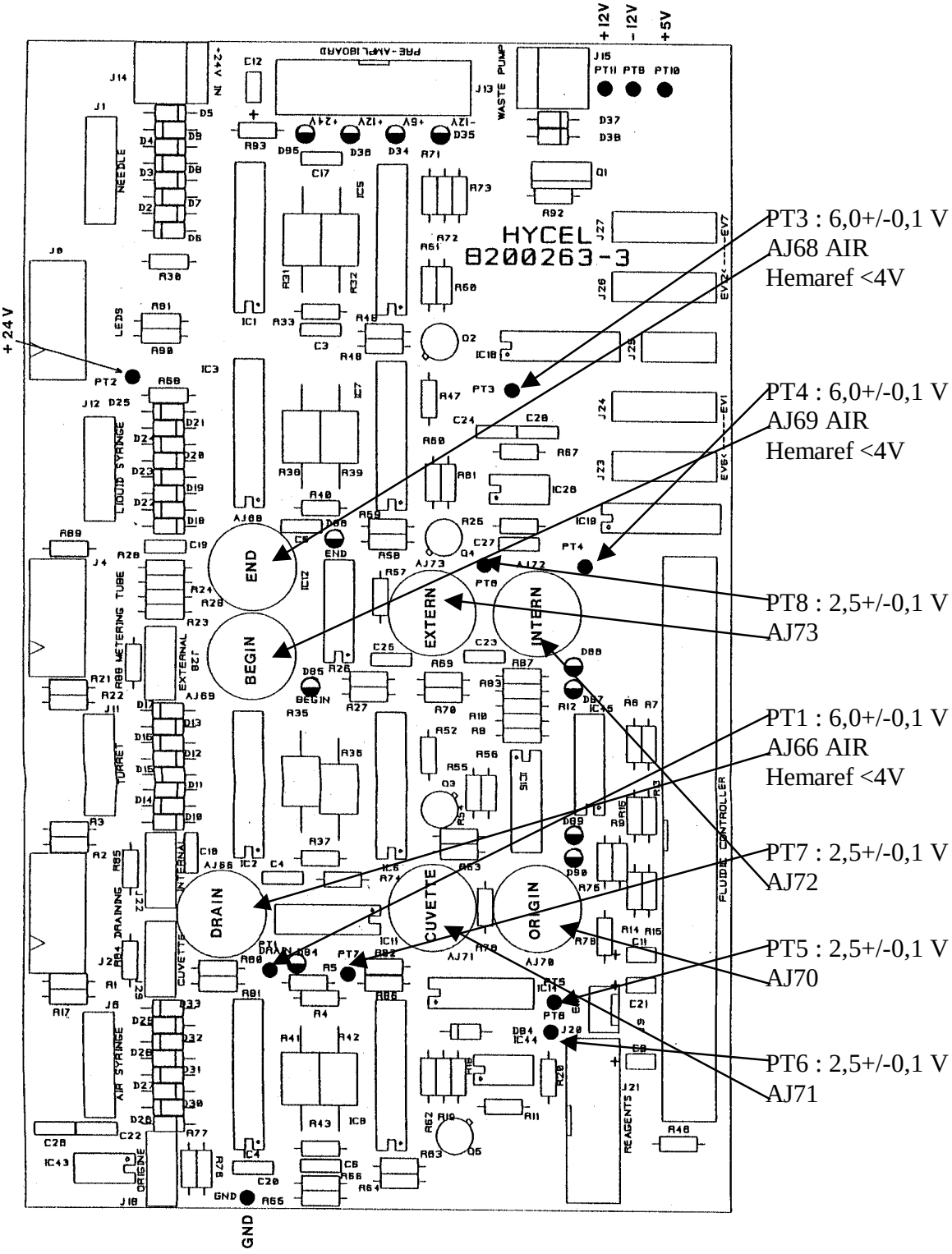


VII Electronic adjustments

VII.1.Motor driver board



Motor driver board Serial number < D1277



PT3 : 6,0+/-0,1 V
AJ68 AIR
Hemaref <4V

PT4 : 6,0+/-0,1 V
AJ69 AIR
Hemaref <4V

PT8 : 2,5+/-0,1 V
AJ73

PT1 : 6,0+/-0,1 V
AJ66 AIR
Hemaref <4V

PT7 : 2,5+/-0,1 V
AJ72

PT5 : 2,5+/-0,1 V
AJ70

PT6 : 2,5+/-0,1 V
AJ71

Motor driver board Serial number ≥ D1277

The ground is found on test point GND.
CAUTION: avoid powerful external light interference during these adjustments.

VII.1.1. Draining detector adjustment

Connect the + of a voltmeter on PT1. Adjust the voltage read at 6.0 VDC +/- 0.1 V on air (tube empty.) with potentiometer AJ66 (near PT1.).
Pour diluent (or Dataclean) in the sink on the cuvettes block. From SERVICE menu, select DRAIN SINK .
The waste pump will empty the sink. When Dataclean passes in front of the Waste Detector, the voltage read must be less than 4 VDC. Make sure the D94 red led on the Motor Driver Board lights up.

VII.1.2. Metering tube detectors adjustment

VII.1.2.1 Upper detector

Connect the + of a voltmeter on PT4. Adjust the voltage read at 6.0 VDC +/- 0.1 V on air (tube empty.) with potentiometer AJ69 near PT4.
From SERVICE menu, select « Metering Tube Rinse ». When detergent (Hemaref II) passes in front of the detector, the voltage read must be less than 4 VDC. Make sure the D85 green led lights up.

VII.1.2.2 Lower detector

Connect the + of a voltmeter on PT3. Adjust the voltage read at 6.0 VDC +/- 0.1 V on air (tube empty.) with AJ68 near PT3.
From SERVICE menu, select « Metering Tube Rinse ». When detergent (Hemaref II) passes in front of the detector, the voltage read must be less than 4 VDC. Make sure the D86 yellow led lights up.

VII.1.3. Turret detectors adjustment

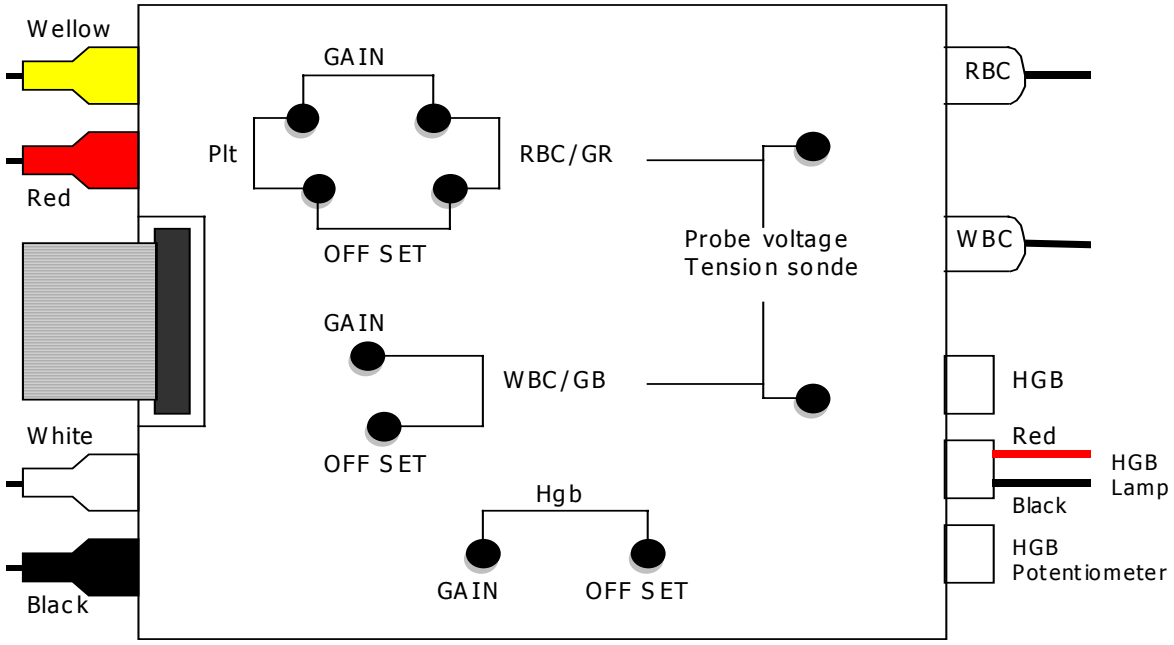
All four detectors must be adjusted to 2.5 VDC +/- 0.1 V out of a detection position.
Connect the + of a voltmeter on :

- PT5 and adjust with potentiometer AJ70 (origin detector on the right. Red led D90).
- PT6 and adjust with potentiometer AJ71 (cuvette pos. detector on the left. Red led D89).
- PT7 and adjust with potentiometer AJ72 (external pos. detector. Red led D88).
- PT8 and adjust with potentiometer AJ73 (internal pos. detector. Red led D87).

NOTE: D89 and D90 are OFF when the detection is activated.
D87 and D88 are ON when the detection is activated.

VII.2.Pre-amplifier board

All potentiometers are indicated on the pre-amplifier cover.



VII.2.1. Hemoglobin channel adjustment

CAUTION: Make sure the counting chambers shield is in place and that there is no possible light interference during this adjustment.

VII.2.1.1 HGB offset

Disconnect the HGB lamp connector at the Pre-amplifier Board input (2 black and red twisted wires connector.).
Connect a special adaptor at the HGB output of the Pre-amplifier Board (black Cinch cable.).
Connect a voltmeter according to the polarity and adjust the offset voltage just upper 0.0 mV with the potentiometer indicated on the Pre-Amplifier Board cover. Reconnect the HGB lamp connector.

VII.2.1.2 Gain HGB

➢ **NOTE**: Wait 20 minutes after put the CELLY on to do this adjustment. Like for the usual utilization, it's better to wait 20 minutes before running startup.

From Main menu, press <F7> to Service, then <F2> Settings; enter password: 2004, then press <F6> for HGB channel setting. If necessary, the instrument will fill the counting chambers with diluent.
The HGB reference value is displayed.
Adjust the HGB gain potentiometer located on the top part of the hydraulic assay near the top of the metering tube to read a channel between 240 and 245 for an ambient temperature around 19°C and 21°C.
In adjusting between 220-225, the variation can be the best.

This adjustment depends on the temperature: HGB reference decreases of about one channel when the temperature increases of one °C.
In any case, the HGB reference value is accepted during the startup procedure if it is within 180 and 254. This adjustment does not require a high precision, it fluctuates during the day.
When adjustment is over, press <ESC> to quit and go back to Service menu.

VII.2.2. RBC and WBC probe voltage adjustment

Connect an electrical adaptor at the input of the pre-amplifying board in place of the RBC probe, (upper connector of the board.).

Connect a voltmeter on this adaptor and select SERVICE menu and then SETTINGS.
Select Probe Voltages ON. Adjust the RBC probe voltage at 20.0 VDC + /- 0.1 V with the potentiometer indicated on the Pre-amplifying board cover.
Then, re-connect the RBC probe cable.

Connect the voltmeter together with the adaptor to the WBC connector on the Pre-amplifying board and adjust the WBC probe voltage the same way.

VII.2.3. Offset adjustment on RBC, WBC channels

For the following adjustment, the ground must be taken on the analog controller on the GND test point. Any other ground point may result in wrong adjustment.

VII.2.3.1 RBC offset

Connect an oscilloscope on test point JP1 (GR INPUT) on the Analog Board and test point GND or a connect a Cinch cable equipped at the other end with an oscilloscope connector on the second connector (from the top) at the back of the analog controller.

Adjust the zero (offset voltage) to 0,00 V with the best precision you can using RBC offset potentiometer located on the pre-amplifier board.

Always check during a diluent count that the offset is properly adjusted and that the background signal is stable and less than 60 mV peak-to-peak if connected at the back of the analog board or less than 20 mV peak-to-peak if connected on the GR input point (the signal at the back is multiplied by 3).

VII.2.3.2 Platelets offset

Connect an oscilloscope on test point JP3 (PLT INPUT) on the Analog Board and test point GND or a connect a Cinch cable equipped at the other end with an oscilloscope connector on the first connector (from the top) at the back of the analog controller.

Adjust the zero (offset voltage) to 0,00 V with the best precision you can using PLT offset potentiometer located on the pre-amplifier board.

Always check during a diluent count that the offset is properly adjusted and that the background signal is stable and less than 130 mV peak-to-peak if connected at the back of the analog board or less than 40-50 mV peak-to-peak if connected on the PLT input point (the signal at the back is multiplied by 3).

VII.2.3.3 WBC offset

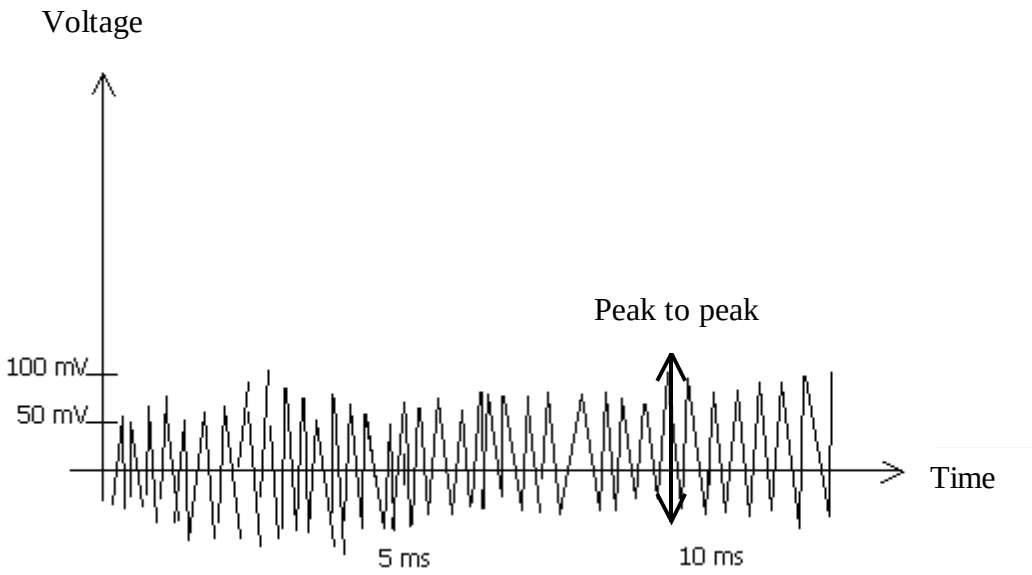
Connect an oscilloscope on test point JP5 (WBC INPUT) on the Analog Board and test point GND or a connect a Cinch cable equipped at the other end with an oscilloscope connector on the third connector (from the top) at the back of the analog controller.

Adjust the zero (offset voltage) to 0,00 V with the best precision you can using WBC offset potentiometer located on the pre-amplifier board.

Always check during a diluent count that the offset is properly adjusted and that the background signal is stable and less than 50-60 mV peak-to-peak if connected at the back of the analog board or less than 20 mV peak-to-peak if connected on the WBC input point (the signal at the back is multiplied by 3).

VII.2.4. Analog gains adjustment

For the gains adjustments, all calibration factors must be set to 1 (see Calibration menu). A CBC-3D control blood must be used. Check its expiration date and make sure it was kept in good conditions and properly mixed.
When gain is increase, histogram drift to the right so MCV increases too.



VII.2.4.1 RBC gain adjustment

Adjust the RBC gain in order to get the target MCV indicated for the normal blood on the Control Assay Sheet (e.g. CBC-3D).
On human sample, RBC indices should be within normal ranges.

VII.2.4.2 PLT gain adjustment

It advisable to use a high-level control blood to perform this adjustment as the MPV result is more accurate if more particles are counted. Never use a low level blood to perform this adjustment.
Adjust the PLT gain in order to get the target MPV indicated for the high control blood on the Control Assay Sheet (e.g. CBC-3D H). The usual mobile PLT high threshold is close to 20 fL. Sometimes it's difficult to see it. On human blood MPV is 9 fL. A partial blocking of the orifice increase the MPV (MCV too, but less). Sometimes the blocking is so low that MPV is the only parameter affected.

Run human samples to check the PLT histograms shape.
A low PLT gain adjustment may result in high PLT results as, in such case, small RBCs may be counted as PLTs.
On normal human samples, the average PLT high threshold is found between 20 and 30 fL.

VII.2.4.3 WBC gain adjustment

Adjust the WBC gain in order to get the lymphocyte peak on normal control blood as target. The lymphocytes peak on CBC-3D normal blood is usually around 80 fL.
Check that the histograms on normal control blood end up close to the 440-445 fl.
The final adjustment will be done according to the results obtained on at least 10 human samples. The histograms must have a good shape and should end up between 330 fL and 360 fL. The lymphocytes peak on human samples is very close to 65 fL.

CAUTION: Always re-check offset adjustments after final gain adjustments as they may slightly have changed.

VII.3.Analog board

For the thresholds and swirling back adjustments, the ground must be taken on analog controller on the GND test point. Any other ground point may result in wrong adjustments.

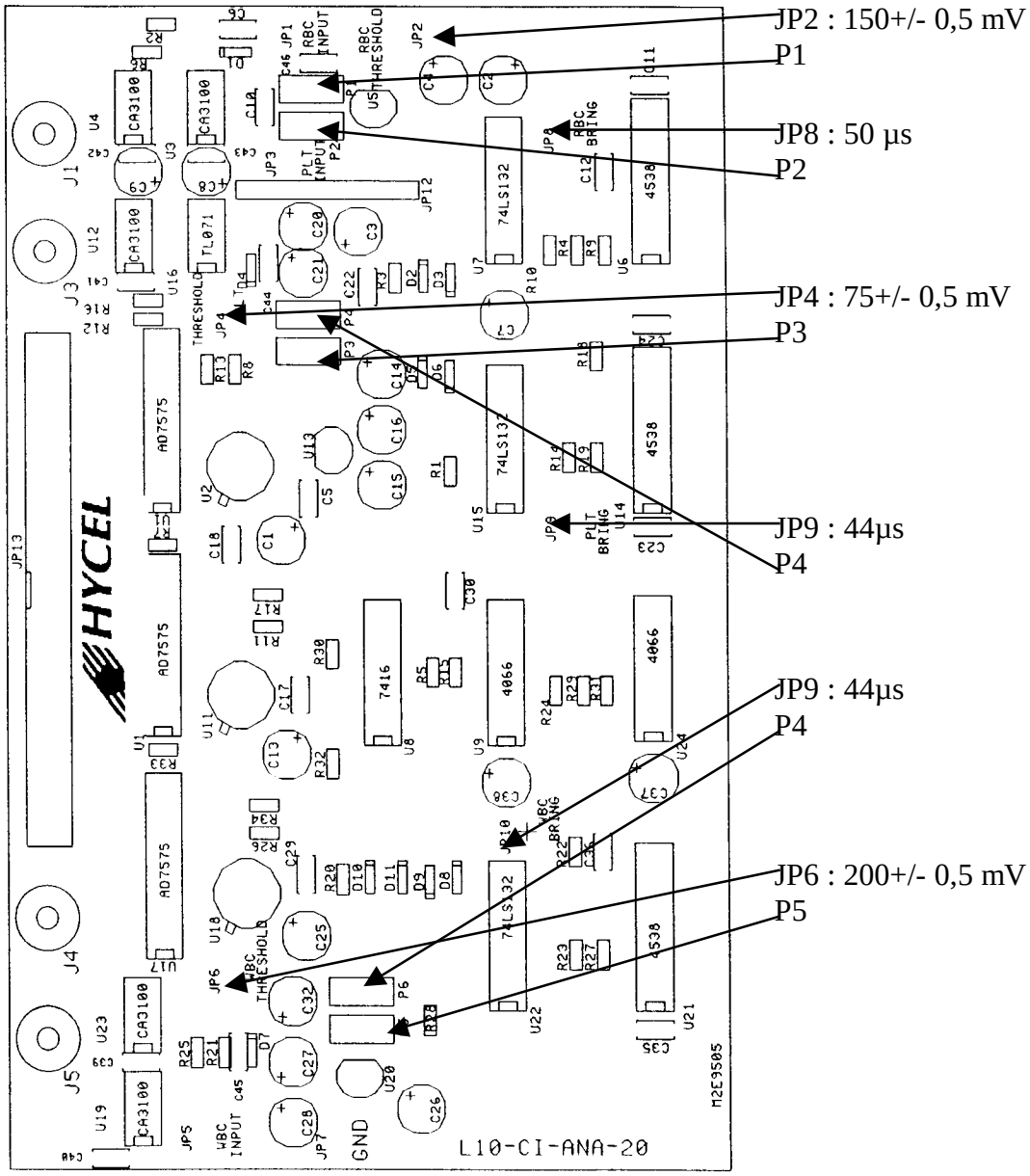
VII.3.1. Counting thresholds adjustments

Connect the + of a voltmeter on test point JP2 (RBC Threshold) and adjust the voltage to 150 mV +/- 0.5 mV with potentiometer P1.
Connect the + of a voltmeter on test point JP4 (PLT Threshold) and adjust the voltage to 100 mV +/- 0.5 mV with potentiometer P3.
Connect the + of a voltmeter on test point JP6 (WBC Threshold) and adjust the voltage to 200 mV +/- 0.5 mV with potentiometer P5.

VII.3.2. Swirling back circuits adjustments

Note: These adjustments must be done with an oscilloscope (1 VDC, 10us). It is advisable to perform these adjustments during blood counts (e.g. normal control blood) as it is easier to visualize the signal in such conditions.

Connect an oscilloscope on test point JP8 and adjust the pulse length to 50 us with potentiometer P2 (for RBC channel.).
Connect an oscilloscope on test point JP9 and adjust the pulse length to 44 us with potentiometer P4 (for PLT channel.).
Connect an oscilloscope on test point JP10 and adjust the pulse length to 50 us with potentiometer P6 (for WBC channel.).



Analog board

VIII Mechanical adjustments

VIII.1.Turret adjustment

VIII.1.1. Electromagnet adjustment

Select SERVICE menu to be able to move the turret as needed.
Check visually the position of the electromagnet in the turret locking hole.
Unlock and lock the electromagnet several times to check if it is perfectly aligned with the turret locking hole.
If it is not, unscrew the two bottom screws to reposition the electromagnet with regard to the turret.
When the electromagnet is correctly aligned, unlock it and check that the turret can move in both directions without friction.
If the electromagnet touches the turret when it rotates, it is possible to move it backwards.
Unscrew the two little screws maintaining the electromagnet horizontally.
Find the right position and screw back the two little screws.
Check again the turret rotation.

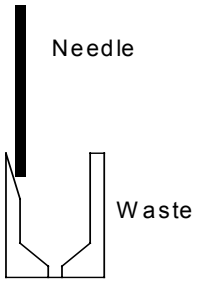
VIII.1.2. Turret assay notched-bell adjustment

The motor driving belt may need to be adjusted if it is too loose or too tight.
In this case, untighten the screws fixing the motor to its bracket inside the Celly.
(See mechanical schematics).
Move the motor position horizontally to slacken or tighten the belt as needed.

NOTE: the belt must never be too tight. If so, moving the turret will be too hard for the motor and mechanical defaults may occur.

VIII.2.Sampling assembly adjustment

VIII.2.1. Needle centering



When one changes the sampling needle assay, it is necessary to center the needle according to the turret hole before screwing it in place.
Select Service menu and twist the needle until it arrive in the middle of the cuvettes. Moreover check that the needle have a good position to eliminate the drop.

VIII.2.2. Needle vertical position

A lever microswitch determines the bottom and upper position of the needle.
Check that the needle does not hurt the side of the sink when the diluent drop is wiped away.
Also check that the needle does not touch the bottom of the blood samples, especially control blood vials.
If the needle is positioned too high, the dead volume in small vials will be too important.
The needle position can be adjusted with the small screw situated on the right side of the needle.

VIII.2.3. Needle assay notched-belt adjustment

If the needle does not seem to move normally or if you get mechanical alerts, it may mean that the needle driving belt is not correctly adjusted.
If an adjustment is needed, unscrew the bottom pinion screw located at the back of the needle assay and re-position the pinion vertically to tighten or slack the belt.

NOTE: the belt must never be too tight as it may prevent the smooth movement of the needle.

VIII.3.Liquid and air syringes adjustment

The lever switch detecting the syringes position must be adjusted in such a way that it is activated about 2 mm before the syringes reach their upper mechanical stop.

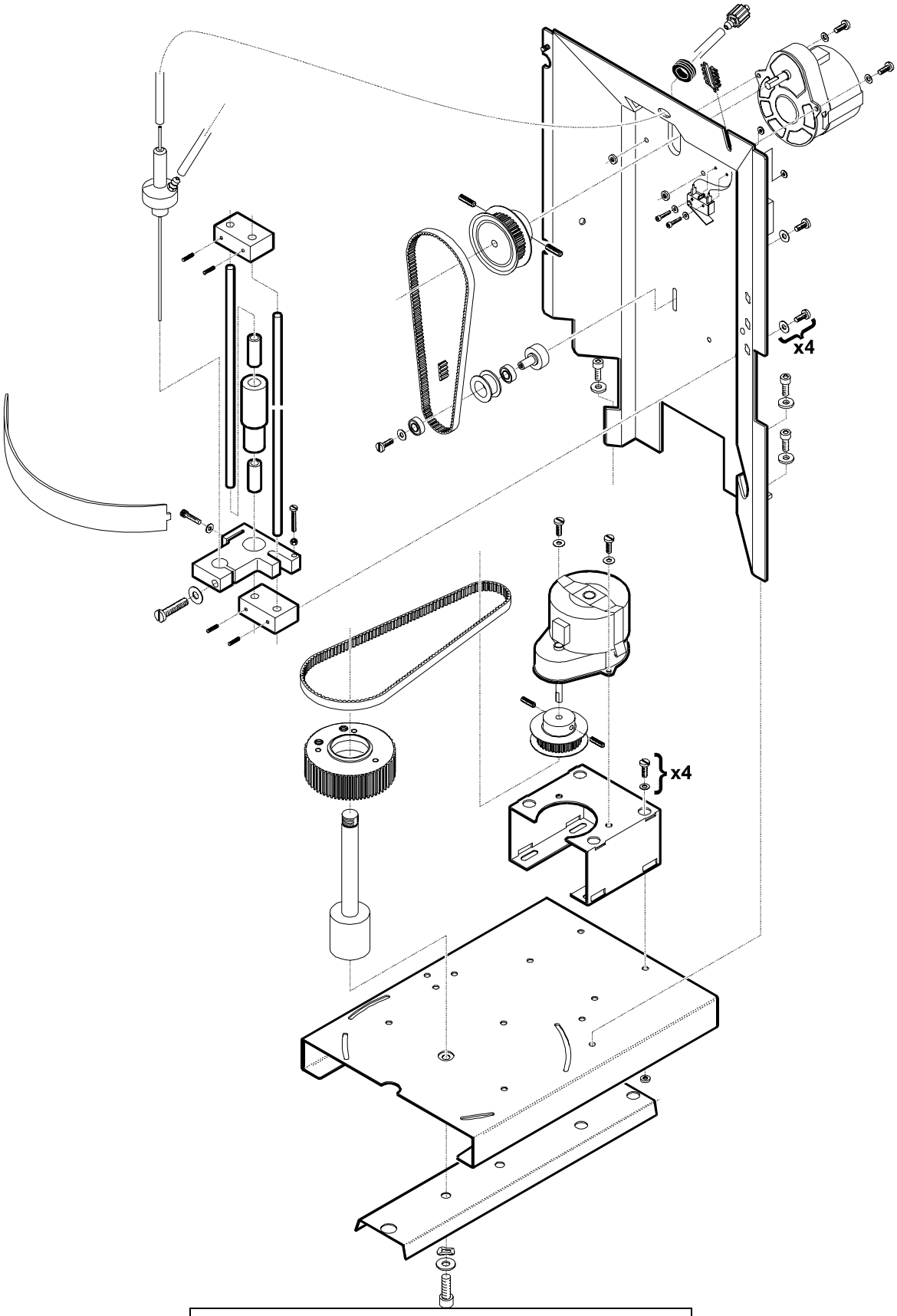
VIII.4.Syringes dismounting

Necessary equipment:
- A little plat screwdriver
- A damp smooth close
- Some silicon grease

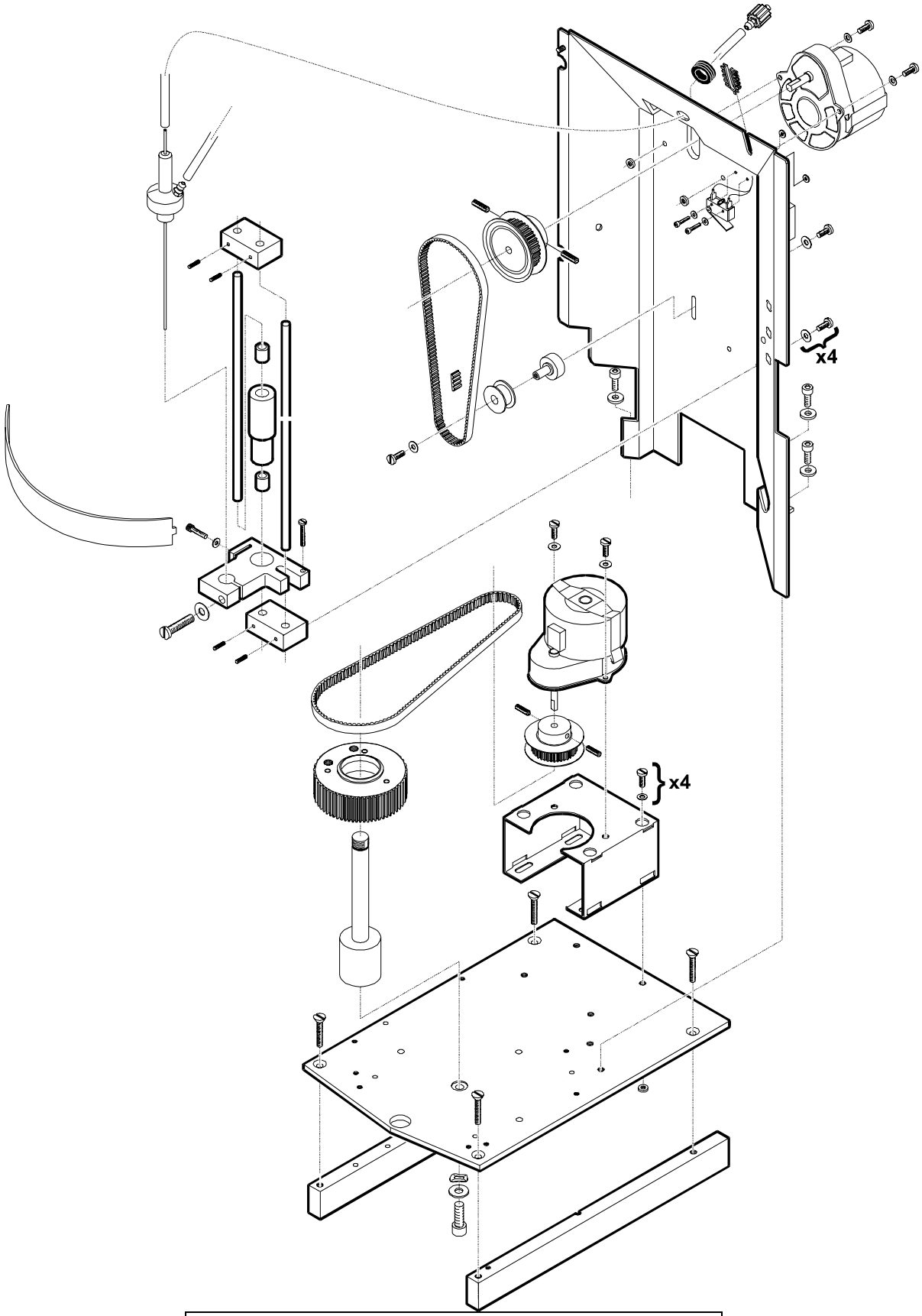
➢ *Note*: The middle syringe contain lysing agent, be careful it can be dangerous.

Unscrew the metalic plate, it maintains the 3 syringes and the white component. Pull off the 3 syringes, and remove the little rings, which maintain the pistons. Only a film of silicon grease must be put on the syringes, if not a lot of electric noise appear on platelets.
Check that the syringes are align before wind up. So make several counting on diluent to have a result near zero for platlets.

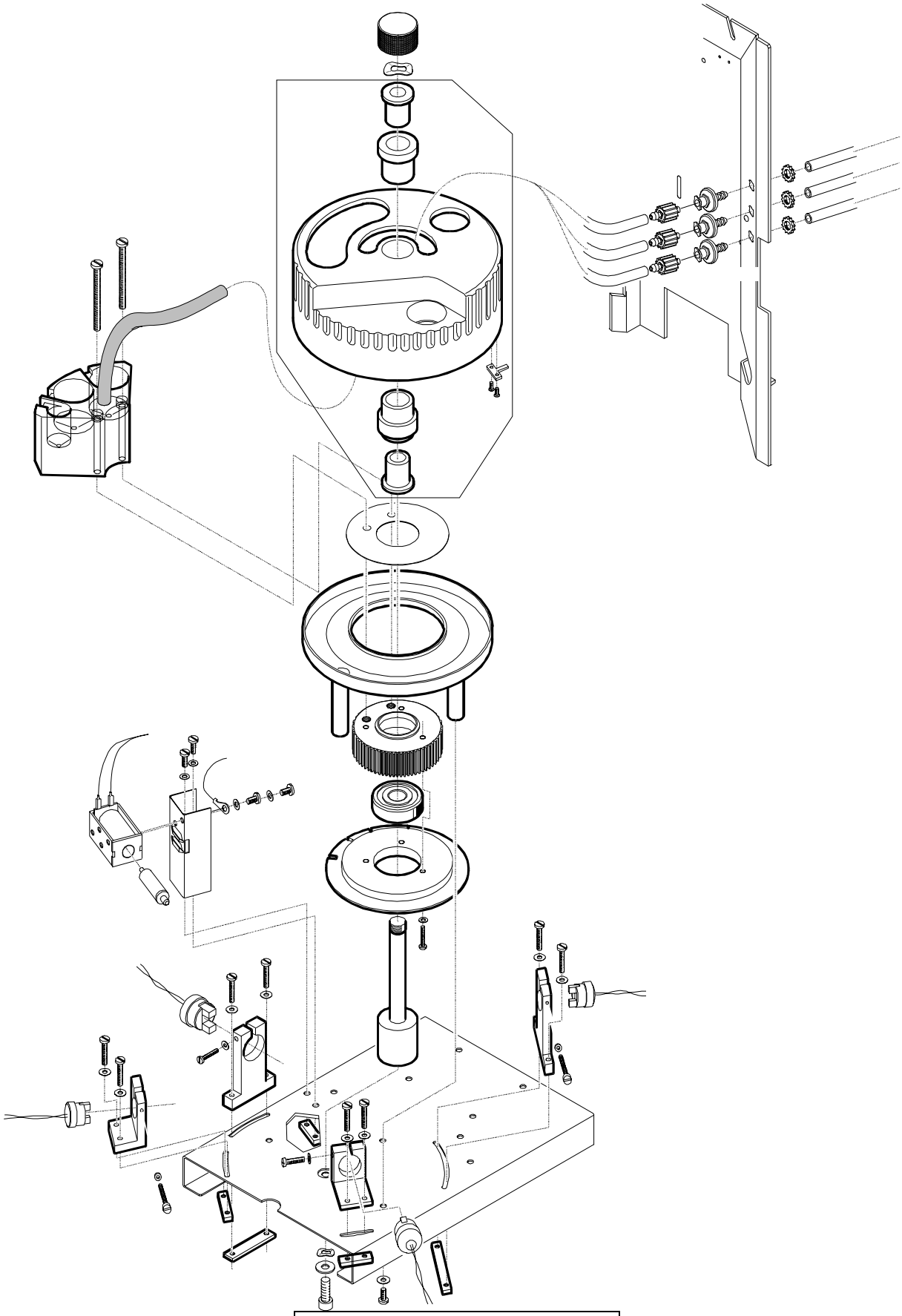
VIII.5.Mechanical diagrams



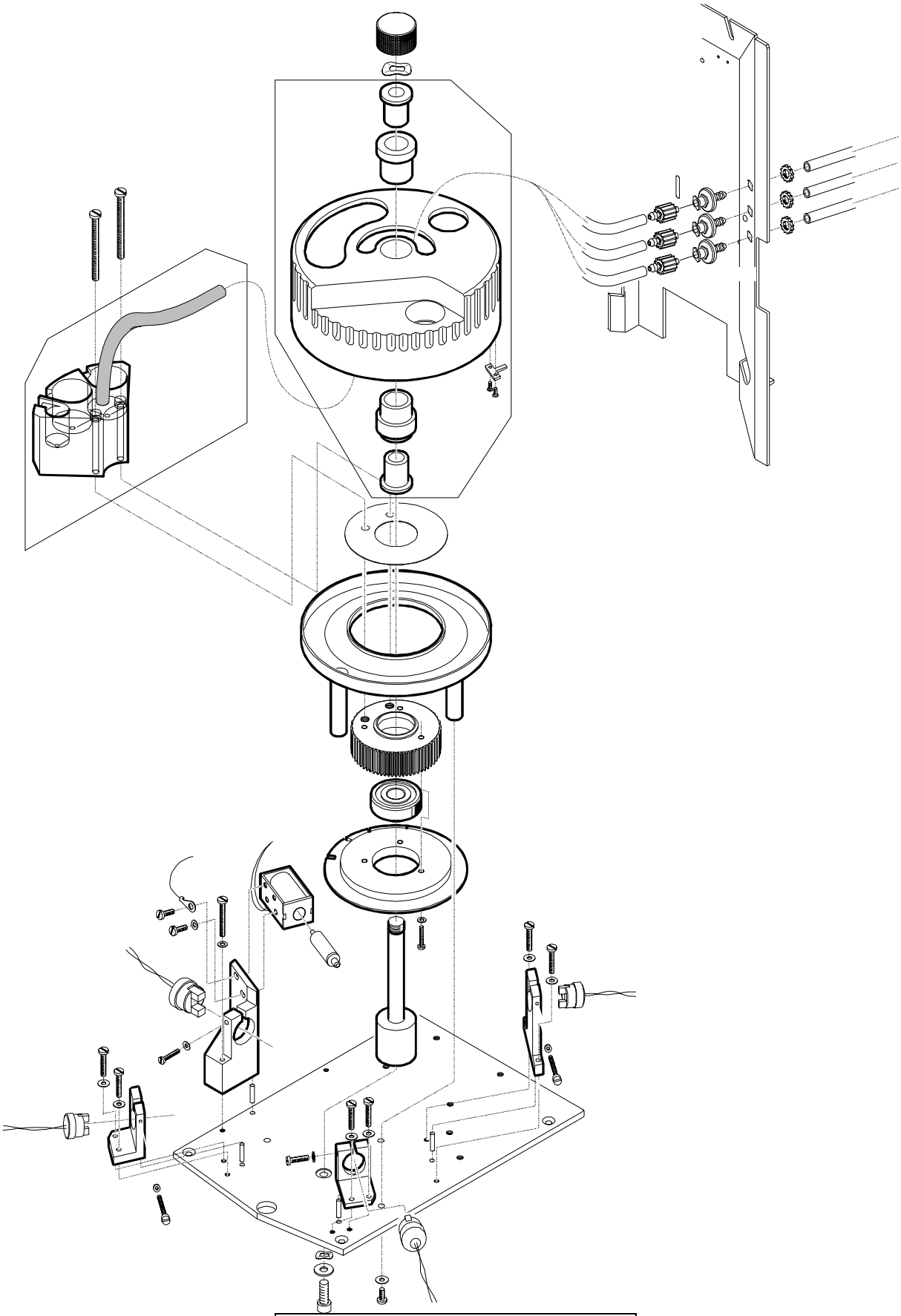
Sampling assembly with adjustment



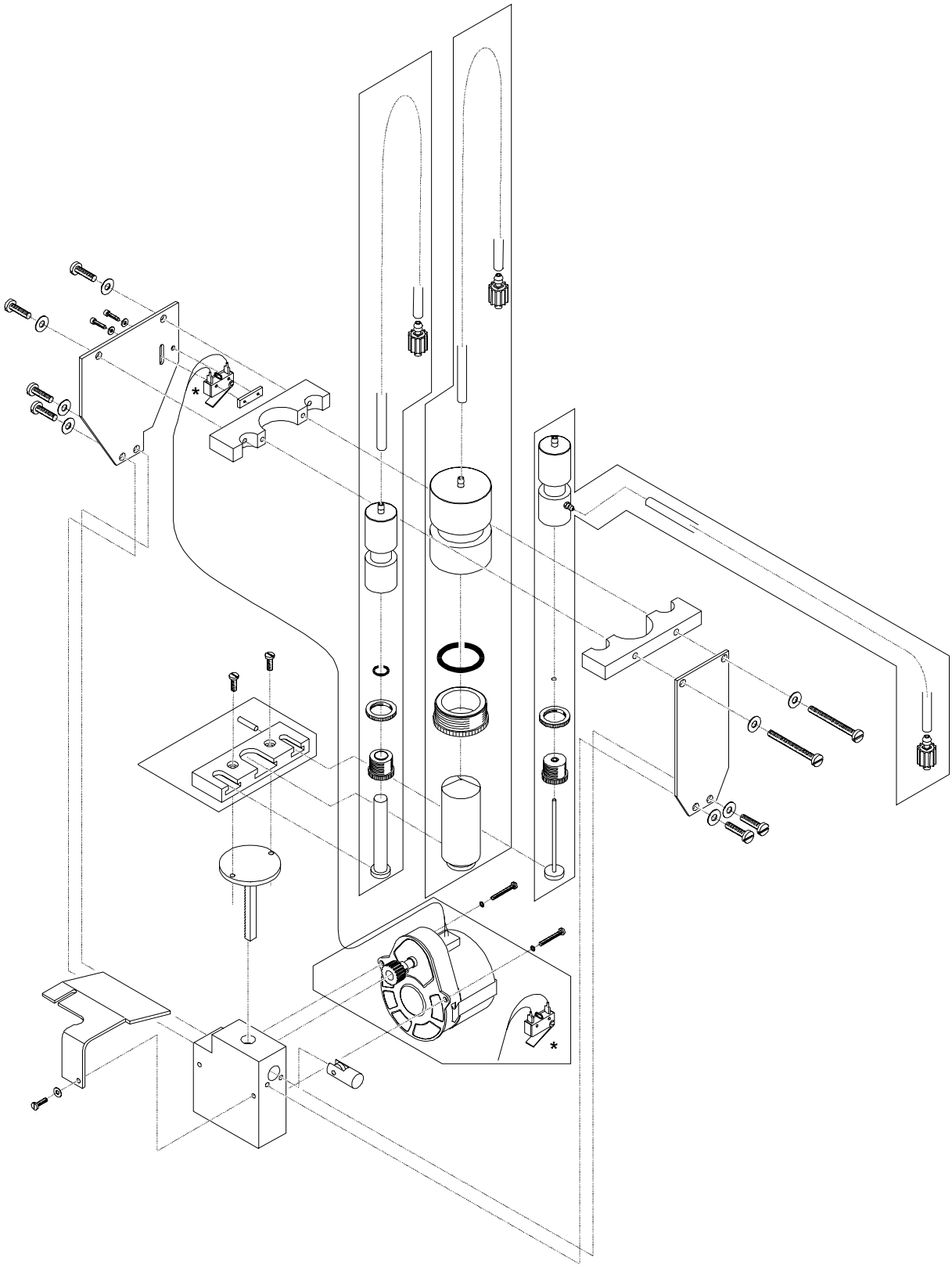
Sampling assembly without adjustment



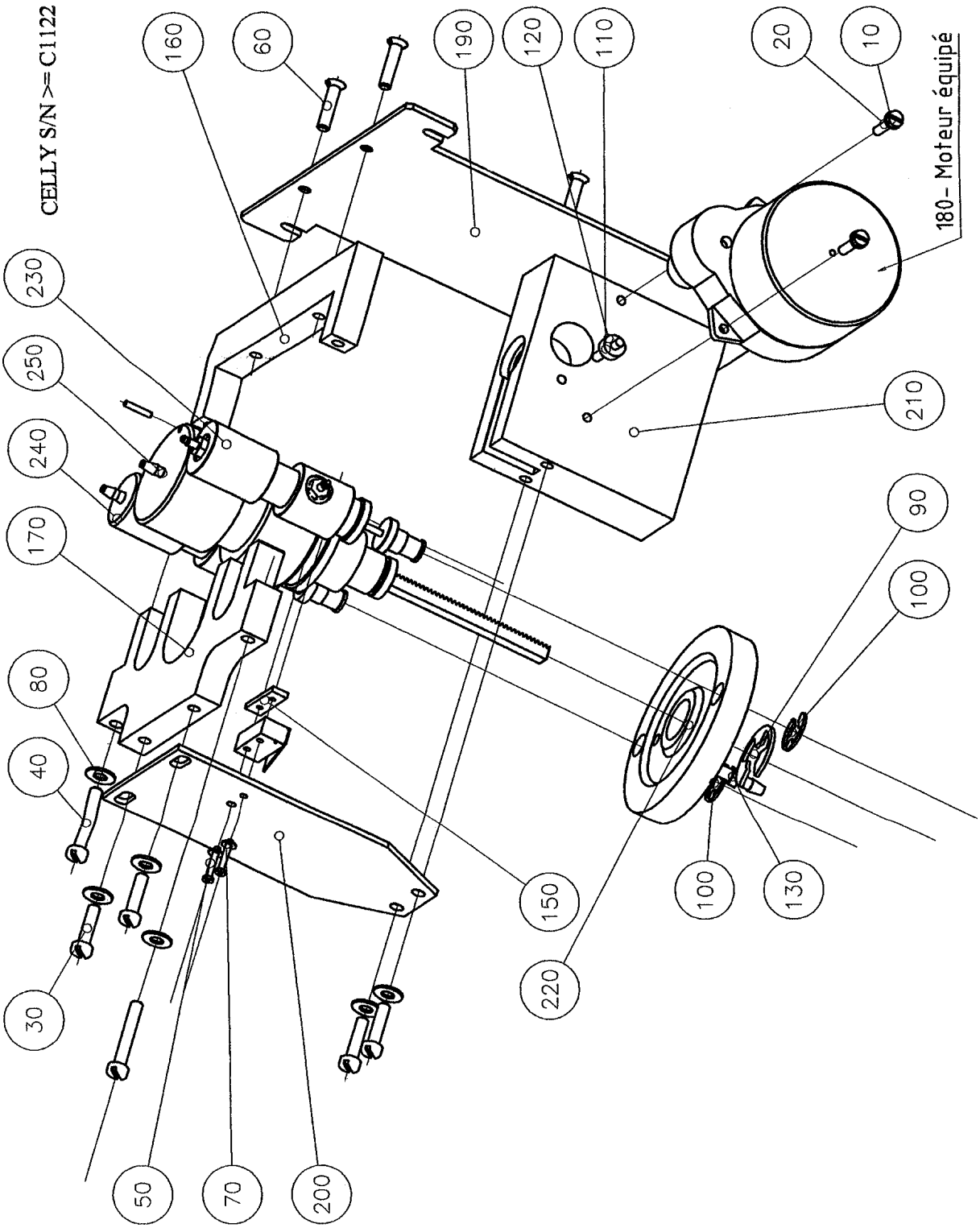
Turret with adjustment



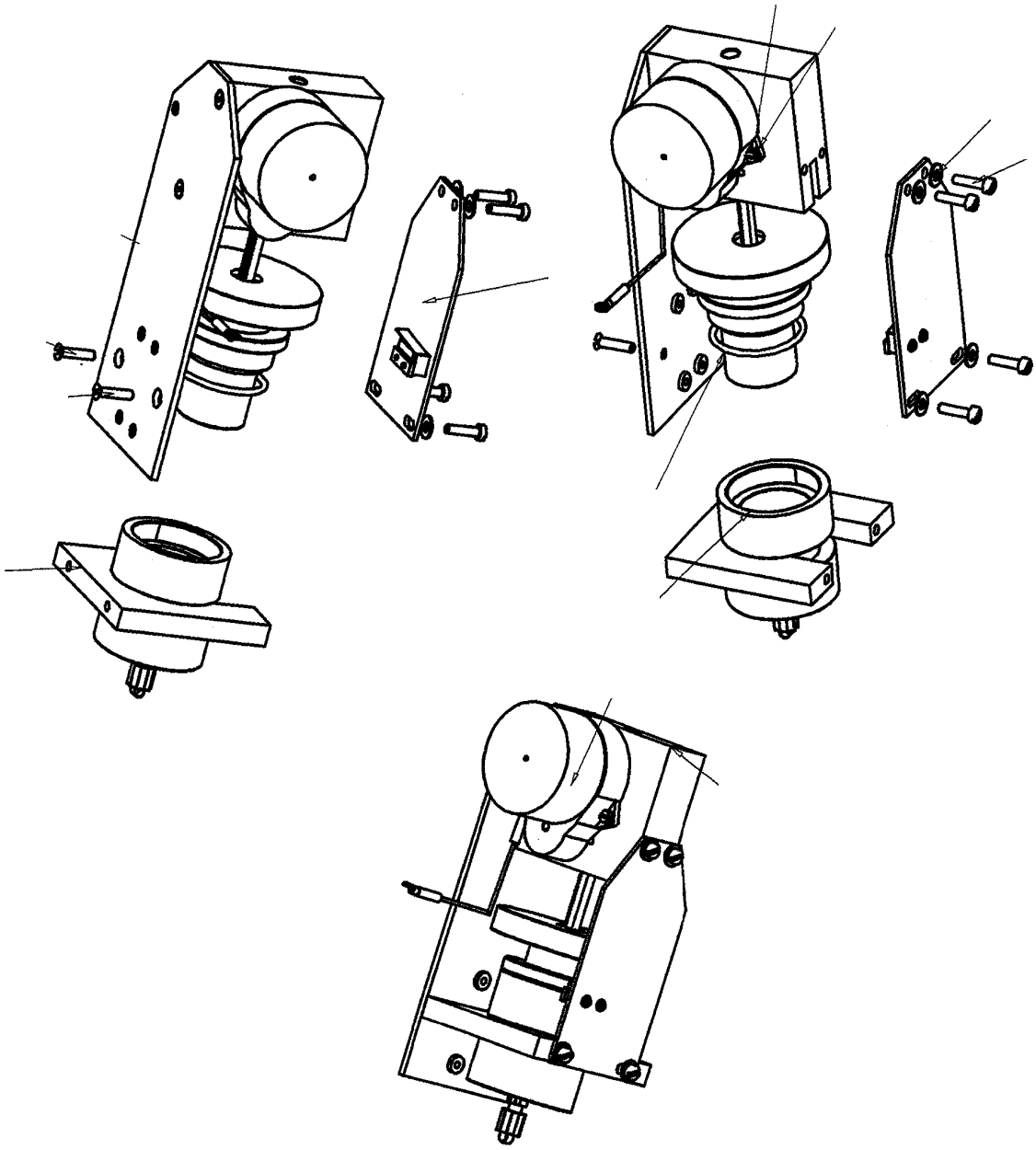
Turret without adjustment



Liquids syringes serial number < C1122

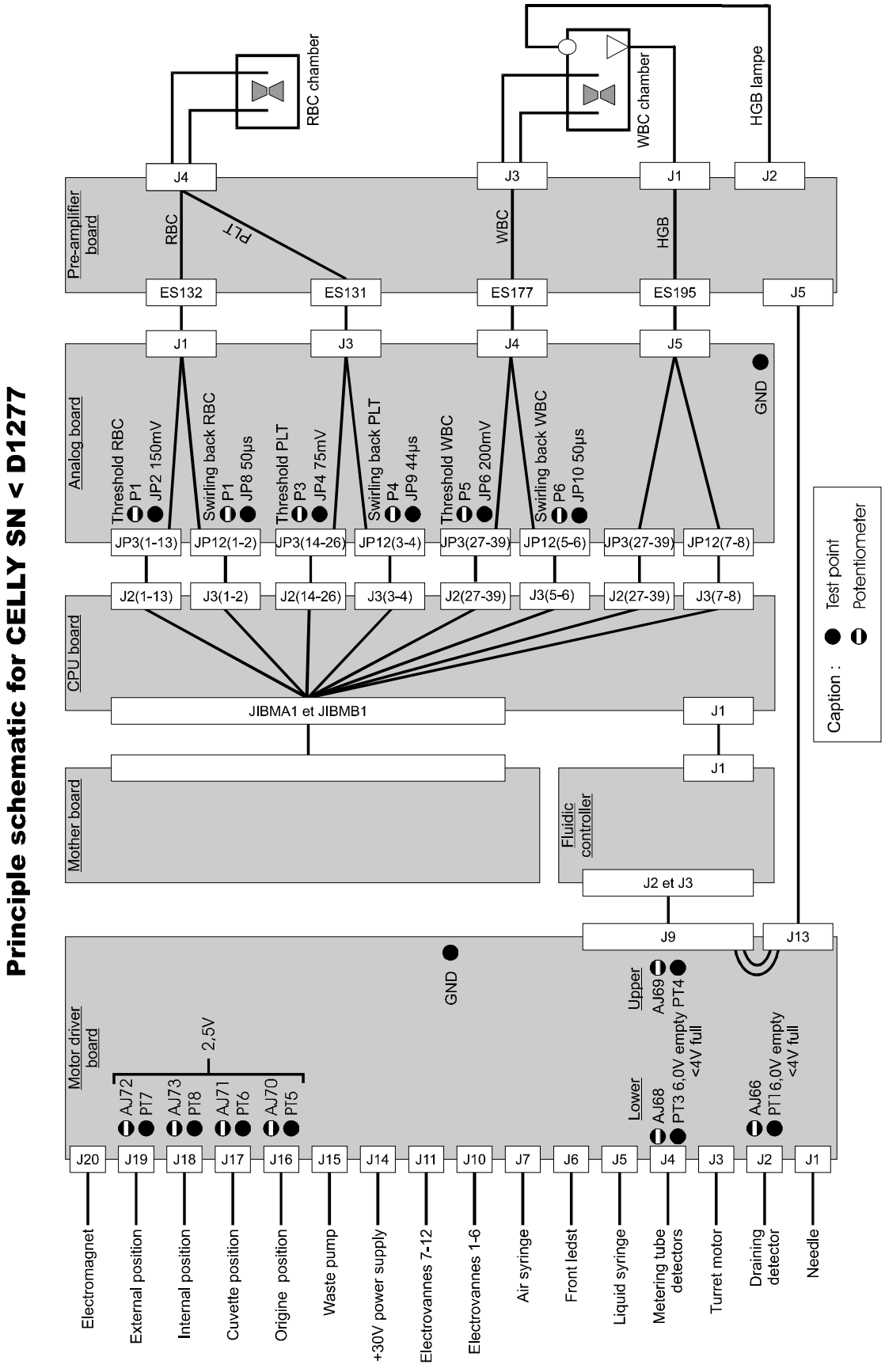


Liquids syringes serial number≥ C1122

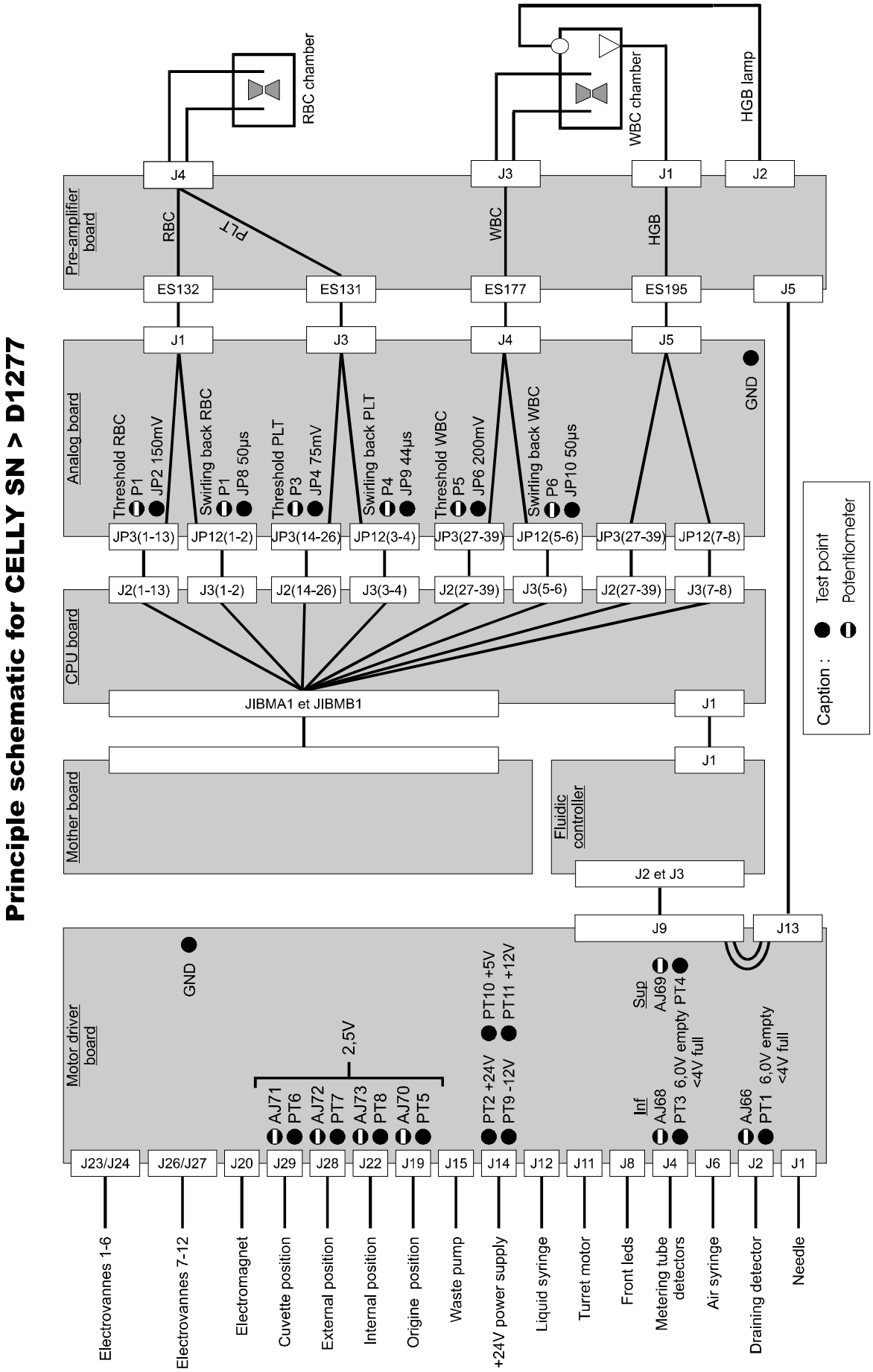


Air syringe

IX Principle schematic



Principle schematic for CELLY SN > D1277



X Spare parts list

Description and characteristics		Reference	Quantity
Silent block	2x M4x8 305AVA	512770010	UN
Cogged belt 6T 2.5/330	T2.5/330 (probe)	514400010	UN
Rinsing block assembly	(turret)	514400060	UN
'O'Ring I.D:2	(sampling needle)	521100005	(5EA/pack.)
'O' Ring R6 PB701	(lyse syringe)	521100105	(10EA/pack.)
"O" Ring R12 bis	(conting chamber cap)	521105270	(10EA/pack.)
"O" ring Viton (black)	(HGB conductor)	521200070	(2EA/pack.)
'O' Ring I.D 23 PB701	(Diluent syringe)	521200230	(5EA/pack.)
'O' Ring I.D:31.42	(Vaccum/pres. Syringe)	521200240	(2EA/pack.)
"O" Ring, large	(orifice)	521202650	(10EA/pack.)
Male luer 3/32	MTL 220.1	522400561	(10EA/pack.)
Bulkhead-mounted fem.	FTLLB 220-1 white	522400611	(10EA/pack.)
Bulkhead-mounted fem.	FTLLB 230-1	522400621	(10EA/pack.)
Lock nut 1/4-28	LNS-1	510546700	(10EA/pack.)
Male luer lock rings	MLLR-1 white	522400581	(10EA/pack.)
Male luer lock rings	MLLR-2 black	522400582	(10EA/pack.)
Male luer lock rings	MLLR-3 red	522400583	(10EA/pack.)
Male luer lock rings	MLLR-4 green	522400584	(10EA/pack.)
Male luer lock rings	MLLR-5 blue	522400585	(10EA/pack.)
Male luer lock rings	MLLR-06 orange	522400586	(10EA/pack.)
Male luer lock rings	MLLR-07 yellow	522400587	(10EA/pack.)
Color code ring white	CCLR-1 RAC	522400650	(10EA/pack.)
Color code ring red	CCLR-3 RAC	522400651	(10EA/pack.)
Color code ring blue	CCLR-5 RAC	522400652	(10EA/pack.)
Color code ring black	CCLR-2 RAC	522400653	(10EA/pack.)
Color code ring green	CCLR-4	522400654	(10EA/pack.)
Color code ring orange	CCLR-06	522400656	(10EA/pack.)
Color code ring yellow	CCLR-07	522400657	(10EA/pack.)
Tube to tube "T"	T420-1	522401720	(10EA/pack.)
Tube to tube "T"┤	T430-1	522401722	(10EA/pack.)
Tube to tube "T"┤	T420/410-1	522401725	(10EA/pack.)
Tube to tube "L"┤	L420-1	522401740	(10EA/pack.)
1/4-28 UNF thread┤	S230-1	522402702	(10EA/pack.)
Tube to tube ┤	N430/420 -1	522401801	(10EA/pack.)
Tube to tube┤	N 220/210-1	522400802	(10EA/pack.)
SIRAI electrovalve 24V	(tubing 1.58x3.18)	523300205	UN
SIRAI electrovalve 24V	(tubing 1.98x3.18)	523300215	UN
Tygon tubing 1/32-3/32	(cons.)	524100040	M.
Tygon tubing 1/16-1/8	(cons.)	524100050	M
Tygon tubing 3/32-5/32	(cons.)	524100070	M
Tygon tubing 1/8-1/4	(cons.)	524100100	M
Silicone tub.1.6/3.2mm	0.0618x0.125in (cons.)	524100550	M
SILIC.TUBING 2.0/3.2mm	0.078x0.125in (cons.)	524100560	M.
Pump 30KNDC wo/cable		525100100	UN
Pompe NF30 24volts	CELLY N/S >= D1277	525100105	UN
Pump repairing kit	Pump KNF 30 KNDC	523500112	UN

'O'Ring R16 PB701	Pump	521100530	(10EA/pack.)
Lever microswitch V4	170 A R 24	533500150	UN
Power ON/OFF switch		533500500	UN
RCA Cinch cables		534400130	UN
Red led W/O resistor		538200140	UN
Green led W/O resistor		538200150	UN
Fan	CELLY	725200130	UN
Sampling Assy (turret)	CELLY platine "fixe"	D310301	UN
Dilution block	avec tuyaux transfert	C610020	UN
Fluidic transf. tubing	transfert CELLY	C610010	UN
Turret knob	CELLY	711410080	UN
Turret ONDUFLEX washer	D10 type D ep 0.3mm	511359115	(5EA/pack.)
Needle left guide	(mÉtallique =gauche)	713110010	UN
Needle right guide	(plastique =droit)	713110015	UN
Turret axis	CELLY	713110170	UN
Turret optic.detector	tourelle (SN>=C1222)	B710061	UN
Turret optic.detector	tourelle (SN=< C1221)	G710061	UN
Sampling needle motor	Mont./desc.aig. CELLY	715800150	UN
Turret motor	CELLY	715800160	UN
Needle protection	CELLY	716440010	UN
Sampling needle	CELLY	724130170	UN
Cabled electro-magnet	CELLY	735000010	UN
RBC counting chamber	RBC (avec orifice)	C110150	UN
External electrode	(longue)	746800190	UN
RBC orifice (Celly)	CELLY	723410210	UN
WBC counting chamber	WBC (avec orifice)	C110160	UN
WBC orifice (Celly)	CELLY	723410220	UN
External electrode	(courte)	746800180	UN
HGB light conductor	HGB	722410275	UN
HGB led with holder	CELLY	B700030	UN
HGB cell with holder	ÉquipÉ CELLY	B700040	UN
Counting chamber cap	ÉquipÉ CELLY	C280130	UN
Mecaworms M3/6 screw	(noire)	711110100	UN
Flat cable 600/60 pts	Interf.<>Gest.fluid.	734052100	UN
Flat cable 700/20 pts	PrÉ-amp.<>Interf.Puis.	734052110	UN
Flat cable 170/10 pts	Gest.flui<>CPU Ana.	734052120	UN
Flat cable 800/10 pts	Tube volum.<>Interf.	734052130	UN
Flat cable 1000/10 pts	Vidange<>Interf.Puis.	734052140	UN
Faisceau leds face av	Leds R/V<>Interf.Puis.	734050975	UN
Cabled buzzer		745050050	UN
Draining glass tube	Di1.55+-0.015ep0.7L66	823500020	UN
Draining PCB	CELLY	B710050	UN
Draining detector Assy	(Complet avec tuyaux)	C790010	UN
Meter.tube PCB	tube volumÉtriq. CELLY	B710040	UN
Metering tube	Di=1.55+/-0.015 ep=0.7	823500030	UN
Meter. tube protection	CELLY	716440020	UN
28V Power supply	LAMBDA EWS100.28	535190210	UN
Cabled PC power supply	CELLY	B190200	UN
Motor driver board	connex. fils CELLY	B200262	UN
CI-INT SN75471P	(IC44 N.M)	543810161	UN
Pre-amplifier Board	(Version < V2.20)	B200270	UN

Pre-amplifier Board	(Version >= V2.20)	B200271	UN
V2.20 +Pre-Amplifier	et pot.HGB (V2.20)	G200271	UN
Valves connect. adapt.	vannes CELLY	B200295	UN
Fluidic controller	CELLY	B200600	UN
Hard disk (front side)		B280311	UN
Floppy disk DRIVER	3.5" 1.4 MB	B280360	UN
QWERTY small keyboard	84T	B420111	UN
Keyboard skin cover	rÉduit 84T (cons.)	516400111	UN
Analog controller	CELLY	B620600	UN
CPU controller	CELLY	B620610	UN
LCD color screen	cablÉ CELLY	B830201	UN
Cable blindÉ LCD coul.	CELLY	534400150	UN
Luminosity/contrast	2 fils CELLY	734050641	UN
Screen control wheel	CELLY	711410070	UN
Pentium Mother Board	SN <B1108	B901620	UN
Pentium Mother Board	INTELP166.SN>=B1108	B901621	UN
Module SIMM 4Mo EDO	1Mx32 60ns	543810920	UN
Radiator with fan	Pentium 75 À 200 MHz	525200110	UN
Lithium battery CR2032	3V (carte MÆre)	535800115	UN
Vacuum/pressure Assy	(SN =< C1177)	C750110	UN
Vacuum/pressure	(SN =< C1177)	C770140	UN
Liquid syringes Assy	(SN=< C1221)	C790090	UN
Motor protection	diluteur	716440030	UN
Lyse syringe	(SN =< C1221)	C770110	UN
Sampling syringe	(SN =< C1221)	C770120	UN
Diluent syringe	(SN =< C1221)	C770130	UN
Vacuum/ pressure Assy	Évac.bas (SN>=C1178)	C750112	UN
Vacu./pressure syringe	Évac.bas (SN>=C1178)	C770142	UN
Dilutor assy (V2)	(SN >= C1222)	C790095	UN
Lyse syringe (V2)	(SN>= C1222)	C770115	UN
Sampling syringe (V2)	(SN >= C1222)	C770125	UN
Diluent syringe (V2)	(SN >= C1222)	C770135	UN
Syringes motor	et ser. air CELLY	715800140	UN
Translucent silicone	(100 g)	571300140	EA
Intern.vacuum/pressure	de vide CELLY	F110040	UN
CELLY accessories kit		G79CA20	UN
Reagents tubing kit		G79CA40	UN
"O"Rings kit for CELLY		G230740	UN
Plastic nipples kit		G230750	UN
Small screwdriver		571600030	EA
Turret adaptor for	tourelle CELLY	728410130	UN
Turret adaptor for	tourelle CELLY	728410140	UN
HGB conduct. distance	(d= 7.2 mm)	716100505	UN
HGB measure cable	CELLY	734050595	UN
Oscilloscope cable	CELLY	734050596	UN
Probe measure cable	CELLY	734050597	UN
CANON BJ250 printer		B850527	UN
715800150 UN	102,6		